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Within-District Resource Allocation and the Marginal Costs of Providing Equal Educational Opportunity: Evidence from Texas and Ohio

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Abstract
This study explores within-district fiscal resource allocation across elementary schools in Texas and Ohio large city school districts and in their surrounding metropolitan areas. Specifically, I ask whether districts widely reported as achieving greater resource equity through adoption of Weighted Student Funding (WSF) have in fact done so. I compare Houston Independent School District (a WSF district) to other large Texas cities and Cincinnati (also using WSF) to other large Ohio cities. Using a conventional expenditure function approach, I evaluate the sensitivity of elementary school budgets to special education populations, poverty rates, and school size. Next, I estimate two-stage least squares cost functions across schools to evaluate the relative costs of achieving average outcomes with respect to varied poverty rates within and across school districts within metropolitan areas. I use these estimates to evaluate whether urban core schools on average spend sufficient resources to compete with neighboring schools in other districts in the same Core Based Statistical Area. I find first that widely reported WSF success stories provide no more predictable funding with respect to student needs than other large urban districts in the same state. I also find that in some cases, resource levels in urban core elementary schools are relatively insufficient for competing with schools in neighboring districts to achieve comparable outcomes.
Keywords: education finance; budgeting; educational equity (finance); cost indices.

Índices distritales de asignación de recursos y costes marginales de proveer prestación igualdad de oportunidades educativas: Evidencias de Texas y Ohio

Resumen
Este estudio explora la asignación de recursos fiscales intra distritales en los distritos escolares de las escuelas primarias de ciudades y áreas metropolitanas de Texas y Ohio. En concreto, se investigó hasta que punto los distritos que informaron ampliamente haber logrado una mayor equidad de recursos mediante la adopción del programa de Financiamiento Estudiantil Ponderado (en inglés Weighted Student Funding FSM), lo consiguieron. Para eso se compararon el Distrito Escolar Independiente de Houston (un distrito FSM) con otras grandes ciudades de Texas y Distrito Escolar de Cincinnati (también utilizando FSM) con otras grandes ciudades de Ohio. Utilizando el enfoque de función convencional de gastos, evalúe la sensibilidad de los presupuestos de las escuelas primarias con respecto de la población que recibe educación especial, los índices de pobreza, y tamaño escolar. A continuación, se estimo en dos etapas los cuadrados menores de las funciones de costo en las escuelas para evaluar los costos relativos de obtener resultados aceptables con respecto a varias tasas de pobreza dentro y entre los distritos escolares en las zonas metropolitanas. Utilice estas estimaciones para evaluar si en promedio las escuelas de los núcleos urbanos gastaron recursos suficientes para competir con escuelas en otros distritos vecinos en un mismo Núcleo Basado en Área Estadística (en inglés Core Based Statistical Area). En primer lugar, encontré que la información ampliamente reportada acerca del éxito de las FSM historias no proporciona una financiación más previsible con respecto a las necesidades de los estudiantes que la proporcionada por otros distritos urbanos grandes en un mismo estado. También encontré que en algunos casos, los niveles de recursos en el núcleo urbano de las escuelas son relativamente insuficiente para lograr resultados comparables a los de las escuelas en distritos vecinos.
Palabras clave: Educación Finanzas, Presupuesto, Equidad de la Educación (Finanzas), Índices de Costo.

Introduction

The call for fair and equitable funding across schools within large school districts has increased in recent years. This current reform wave, promoted as having both liberal and conservative political appeal, combines an approach called Weighted Student Funding (WSF) with decentralized governance including site based budgeting and management (Fund the Child, 2006). Several large school districts including New York City, Washington, DC and the state of Hawaii (which operates as a single district) have jumped on this bandwagon. In short, weighted student funding formulas are used to estimate school based budgets based on the different needs of children across schools and decentralized governance intended to provide school leaders—principals and school-based planning teams—greater latitude over the use of those funds. From a liberal perspective, the provision of need-based aid directly to schools can resolve substantial within-district, cross-school disparities in resources that have been documented for decades. From a conservative perspective, decentralized governance is perceived to promote efficiency and foster school choice. Coupling the two creates both wide appeal and broad-based resistance.

It seems logical that if the state of New York should be obligated to fund the New York City schools at higher levels than other districts in the state because of greater needs, that the city school system should be obligated to fund higher need children and schools at higher levels within the city, especially given that New York City serves over one-third of the state's children across many diverse educational settings within the district.[1] Several authors have documented that the within-district flow of resources to schools with respect to student needs is less predictable and poorly understood in comparison to between-district allocation (Burke, 1999; Roza & Hill, 2003; Rubenstein, 1998).

Much of the problem with current proposals for weighted student funding that are sweeping across large districts is that those proposals are being framed as inextricably linked to decentralized governance of schools, and decentralization of governance has taken center stage (Baker, 2007, 2008). Needless to say, these two major components are separable but can be combined, with logical and fair resource allocation formulas to schools enabling decentralized governance. Unfortunately, the funding allocation formulas that enable decentralization have been presented as an afterthought, usually poorly conceived and highly politicized (Baker & Elmer, forthcoming). More often than not, the only evidence provided as a basis for weighted funding formula designs are current formulas in other cities and testimonials by advocates.[2] Further, there exists only limited if any evidence on the more basic question of whether public school districts adopting weighted funding formulas have achieved any greater degree of within-district, cross-school funding equity and predictability than those opting for alternative budgeting approaches.

Goals of this Article

The analyses herein apply school-level data from large metropolitan areas in Ohio and Texas to address several questions: whether per-pupil expenditures across urban-district elementary schools are more predictable as a function of student needs when using weighted funding than when using other formulas; whether empirical analysis can guide the development of more rational weighted student formulas for targeting money to higher need schools in urban core districts; and whether urban core districts are in reasonable financial position to target resources according to need estimates.

The first task at hand is to evaluate whether districts widely reported as successfully implementing Weighted Student Funding show any greater degree of equity in their cross-school within-district allocation of resources than other comparable districts. For comparability, I evaluate large urban districts within the same state, therefore operating under the same state policy structures for budgeting and accountability. I focus specifically on large cities in Ohio and Texas, where Cincinnati and Houston are two frequently cited Weighted Student Funding success stories in two states where school-level budget data have previously been evaluated.

The second question is more complex, in that I move from evaluating "what is," or current distributions of resources across schools within districts to evaluating "what should be," or the ways in which resources should be distributed across schools to provide equal educational opportunity. I

[1] As a point of clarification to this hypothetical statement, we note that the State of New York does not actually provide to New York City sufficient resources relative to their local competitive market (neighboring school districts in metropolitan area). This statement is merely to suggest that if the state did fully comply with the equal opportunity guidelines we present herein, that it would be a reasonable expectation that the district similarly comply in their distribution of resources across schools.

[2] See, for example, the January 2007 *Fair Student Funding* proposal (New York City Department of Education, n.d.).

adopt an equal educational opportunity framework that states that per pupil budgets should be adjusted across schools to provide children in each school with equal opportunity to achieve a specific outcome level (Baker & Green, 2008; Duncombe & Yinger, 2008). I base estimates on current average levels of performance for students attending same grade schools within each urban district and its surrounding metropolitan area. To generate these estimates, I apply education cost function models across elementary schools within the major metropolitan labor markets of Texas and Ohio (Duncombe & Yinger, 2008). While most education cost modeling has attempted to measure differences in costs of achieving specific outcome targets across school districts in an effort to inform state school finance policies, some recent efforts attempt to estimate cost variation in relation to student needs across schools within districts (Baker & Thomas, 2006; Conley and Rooney, 2007; Stiefel, Schwartz, Iatarola, Chellman, 2007).

Finally, to answer the third question, I address potential contextual constraints to implementing empirically driven weighted student funding formulas across schools within large urban core districts. I focus on the problem of per-pupil spending in schools in neighboring districts competing for teachers in the same labor market. Baker and Rebell (2006) explain that allocating need based budgets across schools within a high poverty urban core district may not be feasible if district resources are insufficient to provide competitive minimum budgets to the district's lowest-need schools, where sufficiency of budgets in the lowest-need urban core schools is contingent on per-pupil budgets of even lower-need schools in neighboring districts. That is, the lowest-need schools in the high poverty urban core require sufficient resources to compete in the teacher labor market with lower-poverty schools in neighboring districts.

Research on Within-District Resource Allocation

The study of within-district resource allocation in public education is not new. But, in recent years, separate and relatively disconnected lines of empirical work have emerged, applying diverse methods of widely varied rigor, with several recent studies more focused on advocacy than accuracy. Studies conducted in the 1990s found significant disparities in resources within districts. In particular, Burke (1999) shows how in Illinois and New York, *gini* coefficients estimated for resource distributions at the school rather than district level reveal significant intra-district disparities that exceed inter-district disparities. Steifel, Rubenstein, and Berne (1998) analyzed school-level data from four large urban districts (Chicago, Fort Worth, New York, and Rochester) in an effort to measure within-district disparities in resources. Stiefel, Rubenstein, and Berne asked two basic questions. First, how much variation is there across school-level budgets within the districts? Second, to what extent is that variation associated with factors that may affect the costs of providing equal educational opportunity across those schools—most notably, rates of children in poverty? As with Burke (1999), the authors found significant variation in resources across schools within districts, but they also found that some of that variation was associated positively with poverty rates across schools. However, this finding was not systematic across settings or school types. For example, Rochester middle schools showed stronger positive relationships between poverty and resources than Rochester elementary or high schools. In follow-up research, Rubenstein, Schwartz, Stiefel, and Bel Hadj Amor (2007) confirm what is generally known about within-district resource inequity, coupled with what is known about the distribution of teachers by their qualifications across schools: "Using detailed data on school resources and student and school characteristics in New York City, Cleveland and Columbus, Ohio, we find that schools with higher percentages of poor pupils often receive more money and have more teachers per pupil, but the teachers tend to be less educated and less well paid, with a particularly consistent pattern in New York City schools" (p. 532).

Roza, Guin, and Davis (2007) evaluate the targeting of disaggregated financial resources across specific student populations, across schools and within large districts. In their most recent work, the authors estimate the average weights implied by existing allocations to specific populations, finding that those weights vary widely across schools. However, significant questions remain regarding the degrees of precision with which the authors were able to identify resources allocated to specific populations of students within schools. Roza and Hawley-Miles (2004) used school-level budget data on Houston and Cincinnati to evaluate whether resources for the general population of students and for specific populations were evenly distributed across schools. That is, did "regular education" students receive comparable funding in one elementary versus another in Houston, and did children in poverty receive comparable funding in one elementary versus another within the district? In short, the "what should be" benchmark in this analysis is that the child in poverty in one school should receive similar resources to the child in poverty in another school, and the gifted child in one school should receive similar resources to the gifted child in another school.

The major conceptual shortcoming of this method is that it entirely fails to account for whether children in poverty or limited English proficient children receive any sufficient support across schools, or on average, whether schools with much higher poverty concentrations received higher levels of per pupil funding than those with lower poverty concentrations. A district could receive a perfect equity index score under this method by allocating $0 per poverty child across all schools and $1,000 per gifted child across all schools, ultimately driving thousands more per pupil in low-poverty schools serving larger gifted populations.[3]

Using this approach, Roza and Hawley-Miles (2004) conclude that Cincinnati in particular had adjusted its formula toward "virtually eliminating inequity in its schools budgets, in part by eliminating the higher funding levels for the high cost school designs and other magnet programs" (p. 22). The authors attribute these changes to a shift from staffing-based budgets to weighted pupil funding, neglecting the possibility that similar changes could be possible through other budgeting approaches. Roza, Guin, Gross, and Deburgomaster (2007) apply the same analytical framework in an analysis of Texas school district budgets from 1994 to 2003. They note: "We then calculate a ratio, called a Weighted Student Index (WSI), of the actual funding received by each school to the funding we would expect if schools received the district's average allocation for its particular mix of students" (p. 78). The authors then find significant disparities over time in cross-school allocation of resources to general and special populations, again implying an important role for weighted student funding as a remedy: "While we would not feel comfortable claiming, based on the analysis here, that student-based budgeting has been the cause of greater equity in Houston's school funding system, findings do show that despite an initial increase in the coefficient of variation, Houston schools have over the longer term made modest improvements in equity since the strategy was put into place" (p. 73).

Carr, Gray, and Holley (2007) adopt a more convoluted framework for making the claim that high-poverty Ohio school districts fail to allocate resources equitably across schools. First, Carr et al. select only 72 high-poverty districts as the target of their critique, but they fail to limit their sample to districts with sufficient numbers of comparable grade-level schools. Then Carr et al. estimate correlations between per-pupil budgets and poverty rates across schools, regardless of grade

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[3] In Cincinnati, for example, Baker (2007) shows that the correlation across schools between poverty rate and gifted student percent is -.88.

level, and tally the number of correlations that are positive and negative, regardless of district size.[4] Concurrently, Carr et al. estimate a "what should be" budget benchmark for each school assuming that districts should allocate resources using weights adopted in the state school finance formula, and tallying the count of correlations that should be positively related to poverty. That is, the state school finance formula is assumed to be a good representation of fairness across students. Baker and Green (2005) and Baker and Duncombe (2004) have shown this approach to be a particularly problematic assumption, where in at least some cases, state legislatures have adopted weighting systems that drive resources disproportionately to lower- rather than higher-need districts. The Carr et al. approach accepts as rational any policy adopted by state legislatures for allocating different levels of resources across schools.

As with Roza and Hawley-Miles (2004), Carr et al. (2007) attribute the inequities they find to conventional "staffing based" budget systems, noting, "Districts, especially larger ones, tend to use staffing allocations to distribute funding. However, these allocations are often a result of central office decisions and collective bargaining agreements, which do not necessarily reflect student needs" (p. 1). Carr and colleagues then conclude, "Employing building-based budgeting is one mechanism to guarantee that wealthy schools within districts are not siphoning off the resources that have been appropriated to help close the achievement gap" (p. 1).

Unfortunately, much of this recent highly politicized and methodologically problematic research seems to have drawn attention away from more rigorous and more conventional studies of within-district resource inequity and potential causes of that inequity. Further, this more recent advocacy research has made the bold leap toward the conclusion that weighted student funding is a logical if not the sole solution.

Weighted Student Formulas in Practice

Despite recent claims to the contrary (Fordham Institute, 2006), weighted student formulas are not new, dating back to school finance textbooks and state policies in the 1950s and earlier (e.g., Mort & Reusser, 1951). Weighted student formulas have existed for decades, primarily as mechanisms for delivering differentiated levels of state aid from state general funds to local public school districts. As stated previously, interest has more recently turned to the allocation of resources to schools *within* districts on a similar weighted pupil basis. The long track record of state-level weighted student funding provides numerous insights that should not be overlooked when applying the approach to within-district allocation, such as the extent to which those systems may become highly politicized and less-than-transparent over time, and in some cases erode rather than advance equity (Baker & Green, 2005). Recent adoptions of weighted student funding plans in Hawaii and New York City have resulted in a substantial confusion and misinformation over the goals and principles as well as the politics of weighted student funding.

In a report commissioned by the Hawaii Board of Education, after the state legislature adopted a combination weighted funding and decentralized governance plan known as the *Reinventing Education Act of 2004,* Baker and Thomas (2006) provided a review of the structure of weighted student funding formulas in Seattle and Houston, as well as evaluating Hawaii proposals on the table in Spring/Summer 2006. However, Baker and Thomas (2006) also point out that such information should be considered the least (not most or only) reliable and valid source for designing

[4] Baker (2007) explains how mixing schools of varied grade level and including districts which may have only one school at each grade level can produce erroneous results.

new policies, instead recommending reliance on a combination of existing research literature on marginal costs and statistical analysis of actual data on Hawaii public schools.

Table 1 summarizes components of the weighted student formulas for Houston, Seattle, and Hawaii from the Baker and Thomas (2006) report, and the table also includes New York's *Fair Student Funding* model. Notably, existing and proposed models reviewed by Baker and Thomas (2006) are little more than ad-hoc collections of block grants provided across schools coupled with arbitrarily set base per pupil funding and nominal adjustments for at-risk children and children with limited English language proficiency.

Table 1
Selected components of weighted funding formulas (elementary schools only)

	Houston, 2003–04	Seattle, 2006–07	Hawaii, Initial Proposal(2006)	New York, 2007–08
Assumed elementary enrollment	$500	$250	N/A	N/A
Allocations outside of WSF formula				
Overhead foundation allotment		$869 (per pupil)		$200,000 (per school)
Other foundational (non-WSF)				
Head Start		$300		
Negotiated stipend		$1,000		
Title I distribution	$371			
Small, isolated, or special schools	Small Magnet		Isolated	
Weighted formula components				
Base pupil allotment	$2,832	$3,019	$4,288	$3,788
Grade level (elementary) adjustment		$373	variable	
Bilingual program yield	$283	$916	$809	$1,515
At-risk yield	$357	$427	$429	$909

Source*:* Selected components for Houston, Seattle and Hawaii from Baker and Thomas, 2006. New York information from the New York City Department of Education, available online from http://schools.nyc.gov/Offices/ChildrenFirst/FairStudentFunding/KeyElements/default.htm

Seattle Public Schools recently abandoned its weighted student funding model, but it had used the model longest among the districts described in Table 1 (Seattle Public Schools, 2007). The Seattle model allocated a block grant (called a foundation allotment) to each elementary school in the amount of $217,177 for the basic operations of each elementary school of 250 students, or $869 per pupil. Seattle then provided base funding for the weighted pupil formula of $3019, with $373 added for elementary schools, bringing the base aid per pupil to $3,393 for elementary schools. The use of a separate foundation allocation in Seattle meant that as much as 26% (869/3393) of funding was allocated beyond the weighted formula. Such an option is typically a political concession to *spread the wealth* rather than target resources to higher-need schools—the espoused goal of weighted student funding. In 2006–07, elementary schools received an additional flat stipend of $1,000 beyond the weighted formula, further reducing need-based targeting of resources (Seattle Public Schools, 2006). Seattle's yield per child qualifying for free or reduced lunch was $427 in 2006–07, and for children in bilingual education programs, the per-child yield was $916 (about 27% over $3,393, but only 17% over $5262 [3393+869+1000]).

As of 2003–04, Houston allocated Title I resources and small and magnet school budget adjustments outside of the weighted formula. In 2003–04, the base aid within the weighted formula was $2,832, increased to $3,071 by 2007–08. Weights for bilingual education and at-risk children were notably lower in Houston than in Seattle. Houston's at-risk allocations were based on a combination of test performance and qualifying for free or reduced lunch. As of spring 2006, the Hawaii board of education had established base aid of $4,288 per pupil, with bilingual program aid at $809 and at-risk weighting at $429. The formula also included adjustments for remote and/or isolated schools. Finally, at the time of initial phase-in, parameters on New York's *Fair Student Funding* model included a $200,000 flat allotment per elementary school, a base aid figure of $3,788, a weight for English language learners of 40%, or $1,515 and a weight for children qualifying for free or reduced lunch (grades K-5) of 0.24.

Needless to say, each data element in Table 1 represents a political decision. Each figure and calculation represents an opportunity to drive funding appropriately to higher need schools or districts, or alternatively, through political tug-of-war produce a funding system even less equitable than a simple flat allocation of per pupil funding across schools. Amazingly, despite the large sums of money involved, none of the implemented or proposed policies above were guided by empirical analysis of documented marginal costs for the student populations in question.[5]

Sorting through Competing Methods

Three questions are addressed herein, the first of which is whether some districts allocate their resources more equitably than others. That is, as in other studies, I address a "what is" question first. Next, I venture into more complicated ground by addressing a "what should be" question, attempting to estimate the margin of difference in the costs of providing equal opportunity to achieve specific educational outcomes across schools within large urban districts and other schools in the same major metropolitan area. Several published, peer-reviewed studies provide useful insights into methods that may be used for each purpose. In addition, Berne and Stiefel (1984) provide specific guidelines for evaluating current conditions, including both overall variations in resources across school settings and whether that variation is rationally associated with factors assumed to affect the costs of providing equal educational opportunity.

Measuring Within-District Equity

I reject outright recent studies that attempt to show whether children in poverty in one school are treated similar to children in poverty in another school in the same district regardless of whether that treatment is equitable compared to other children in the same district. I also reject outright the more convoluted and deceptive strategies proposed by Carr et al. (see Baker, 2007). Evaluating within-district equity is simpler and more straightforward than recent advocacy studies would imply. I decompose one within-district equity question into two questions, similar to the work of Stiefel, Rubenstein, and Berne (1998): Is there variance in spending across schools, and is the spending variance predictable as a function of well-understood cost factors, including student needs? The first of these questions is addressed simply by calculating the means, standard deviations, and coefficients of variation in per-pupil spending across regular elementary schools within each of the

[5] In 2001 and again in 2004, the Texas Legislature commissioned statewide studies of cost variation across school districts in an attempt to inform the redesign of the state school finance formula.

districts in question and across the metropolitan area for each district. The second is addressed by estimating *expenditure functions,* or regression models in which school-level spending data are the dependent variable and various school cost and student-need-related cost measures are included as independent variables. This method was proposed by Berne and Stiefel (1984) and has been applied in numerous other studies through the years, including Toutkoushian and Michael (2007) in an evaluation of the rationality of Indiana's Complexity Index, a tool used in the state funding formula for differentiating resources across districts.

Estimating the Marginal Costs of Equal Opportunity

Since the 1980s, two basic approaches have been applied to the measurement of education costs and variations in costs across settings and children: input-oriented approaches based on the resource cost model and outcome-oriented approaches based on statistical models of education spending and production of outcomes. Resource cost modeling strategies identify appropriate service delivery models for meeting the needs of varied student populations, where those service delivery models are based on estimates of the appropriate quantities and qualities of educational resources (e.g., Hartman, Bolton, & Monk, 2001). Central to resource cost estimates are the appropriate quantities and qualities of teachers required to achieve certain outcome objectives with certain students. Recent attempts to identify appropriate resource quantities and configurations have relied either on panels of education experts (professional judgment approach) or attempts to synthesize existing research on reform models and educational interventions (Baker, 2005).

Alternatively, authors beginning with Garms and Smith (1970), and more recently Downes and Pogue (1994), Duncombe and Yinger, (1997, 1998, 1999, 2000, 2006, 2007a, 2007b), Reschovsky and Imazeki (2004), and Gronberg, Jansen, Taylor, and Booker (2004) have applied statistical models associating education spending, outcomes, and various student demographic and district structural attributes to estimate the costs of achieving specific educational outcome levels and how those costs vary from one district to the next and from one child to the next. This method has become known as the Education Cost Function. In a review of cost analysis methods, 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). I apply this latter method to identify how costs associated with student needs vary across schools.

Data and Methods

Data for this study are from the states of Texas and Ohio and include school-based budget data from each state's statewide financial reporting system. I focus specifically on regular elementary schools in large city school districts in Ohio and Texas. These include Cincinnati, Cleveland, and Columbus in Ohio and Austin, Dallas, Houston, and San Antonio in Texas.[6] In certain analyses, I also include all other elementary schools that share the same Core Based Statistical Area with the urban core district. For Ohio, I focus on data from 2002 to 2007, and for Texas, from 2005 to 2007. In Ohio, Cincinnati is frequently cited as a weighted student funding success story (Roza & Hawley-

[6] For Texas cities, we select the largest "core" district within each major metropolitan Core Based Statistical Area (CBSA). For space purposes herein, we exclude Ft. Worth, the second largest district in the Dallas CBSA, but a district larger than others in our sample.

Miles, 2004) while Columbus is targeted as an example of grave disparities that should be corrected by court-ordered implementation of weighted student funding (Osberg, 2006).

Table 2 (overleaf) provides a summary of the two school-level panel data sets. Each district has at least 40 regular elementary schools. In each case, the proportions of children qualifying for subsidized lunch are higher in the elementary schools in the urban core district than their surroundings, and in Ohio in particular, the concentration of Black students is much higher in the urban core elementary schools than in the surrounding area. In Texas districts, the Hispanic population share is higher. Regarding annual operating expenses per pupil, Ohio urban core elementary schools outspent other elementary schools in the same labor market. In Texas, spending differences between urban core and neighboring elementary schools were mixed, with Austin schools outspending their neighbors, but Dallas schools lagging behind.

Overall variation in resources across schools within Ohio school districts is lowest in Cincinnati, the district that adopted weighted funding, and in Texas the overall variation in resources across schools was lowest in Houston and San Antonio; Houston had adopted weighted student funding. That said, overall lack of variation may not be a good thing, if student needs vary widely across schools.

Expenditure and Cost Models

I estimate two types of regression models on school-level spending herein. First, using data on the regular elementary schools within each large urban core district, I estimate an expenditure function where the goal is to determine whether existing variation in spending across schools within districts is a predictable function of major cost factors. Factors affecting the costs of providing equal educational opportunity across schools include economies of scale, or school size, and student population composition. Capturing variations in student population composition at the school level within large, poor urban districts is problematic. All of the elementary schools in the urban core districts have very high fractions of children qualifying for free and reduced lunch. In short, the income threshold used (185% poverty level) is too high to capture the variation across schools within these cities. In 2007, all Cleveland elementary schools reported 100% of students qualifying for free and reduced lunch. But the schools are substantively and statistically different from one another when considering a wider array of student population characteristics and multiple years of data. To better capture student population variation across schools, I estimate a separate model across all schools in the sample (urban core and others in the metro area) across metropolitan areas within state, and over multiple years, to generate a predicted at-risk index for each school. I estimate separate models for the Texas and Ohio metropolitan areas:

$$\textbf{At-risk}_s = f(\textbf{\%Black}_s, \textbf{\%Hispanic}_s, \textbf{\%ELL}_s, \textbf{Income}_d, \textbf{College}_d, \textbf{CBSA})$$

That is, I predicted reported subsidized lunch rates across all schools in the major core based statistical areas in each state as a function of school-level proportions Black, Hispanic, and English-language learning (ELL) (Ohio only), district-level median household income, proportion of adults with a college education, and a Core Based Statistical Area fixed effect for each CBSA within the state (3 in Ohio and 4 in Texas). For the expenditure functions, I use both the subsidized lunch measure and the predicted subsidized lunch, or At-Risk measure. The expenditure functions evaluating the current rationality of spending variation across schools may be expressed as follows:

Table 2
Descriptive statistics on elementary school matched panels

Variable	Ohio (2002 to 2007) Cincinnati*	Cleveland	Columbus	Texas (2005 to 2007) Austin	Dallas	Houston*	San Antonio
Elementary schools							
District	40	62	76	56	110	140	54
CBSA (excluding district)	158	226	186	67	481	343	158
Students (2007)							
District	17,079	26,658	25,116	34,016	70,834	86,155	27,167
CBSA	68,169	88,387	72,439	45,743	288,990	262,107	100,308
% with free/reduced lunch							
District	72%	100%	66%	82%	91%	85%	92%
CBSA	30%	29%	25%	46%	55%	58%	64%
% Black							
District	71%	69%	58%	14%	26%	29%	6%
CBSA	10%	15%	7%	11%	18%	19%	8%
% Hispanic							
District	1%	13%	6%	71%	69%	62%	91%
CBSA	2%	3%	3%	43%	39%	45%	65%
Mean spending							
District	$10,580	$9,867	$10,732	$6,232	$4,840	$5,896	$5,825
CBSA	$8,585	$9,138	$8,227	$5,023	$5,546	$5,294	$5,857
Coefficient of variation							
District	**10%**	**17%**	**16%**	**15%**	**19%**	**11%**	**11%**
CBSA	24%	26%	18%	14%	14%	13%	14%

*—District uses Weighted Student Funding. CSBA always excludes the named urban district.

$$\textbf{Expend}_s = f(\textbf{Size}_s\,,\ \textbf{Disability}_s\,,\ \textbf{At-risk}_s\,,\ \textbf{LEP/ELL}_s),$$

where spending per pupil is expected to vary as a function of differences in the percent of children with disabilities across schools, differences in the percent of children on subsidized lunch or the at-risk index, and the percentages of children with limited English language proficiency (Ohio only).[7] I also include two school size categorical variables, because spending per pupil is often a significant function of economies of scale. Extensive reviews of economies of scale in education suggest an optimal elementary school size between 300 and 500 students (Andrews, Duncombe, & Yinger, 2002). That said, within any large urban school district small, excessively costly small schools are arguably unnecessary and may create significant inequities. The spending functions are estimated entirely within each of the seven urban districts.

For the cost models, the goal is to capture existing relationships between spending variation across schools and outcome variation across schools to determine how spending is associated with achieving specific educational outcomes across different schools serving different student populations. For each state, the goal is to estimate a global model of these relationships for the sample elementary schools. That is, the goal is to estimate the average relationship between costs and student population characteristics at constant outcomes for the Ohio schools in one model and the Texas schools in another. In each state I include only those schools in the largest Core Based Statistical Areas. To capture the input-outcome relationship, the samples of schools must include sufficient variation in both inputs and outcomes. As such, I include in these models elementary schools both in the urban core and in neighboring districts in the same Core Based Statistical Area. The modified spending, or *Cost* function model may be expressed as follows:

$$\textbf{Expend}_s = f(\textbf{Outcomes}_s\,,\ \textbf{Size}_s\,,\ \textbf{Disability}_s\,,\ \textbf{At-risk}_s\,,\ \textbf{LEP/ELL}_s\,,\ \textbf{CBSA, Inefficiency})$$

Here again, spending per pupil is in the position of the dependent variable. As previously noted, the goal is to discern how spending per pupil varies across schools as a function of school size and variation in disability shares, at-risk shares and children with limited English language proficiency. I also include a dummy variable for each Core Based Statistical Area to account for variation in labor costs and other potential unmeasured differences across labor markets within Texas and Ohio.

In this case I also include a measure of the percentage of children scoring proficient or higher on state assessments. That is, I attempt to evaluate how spending varies across schools in relation to school size and student population characteristics, at constant outcome levels. The goal is to discern how much more or less must be spent, on average, to achieve specific outcomes. This approach raises two concerns. First, how might one control for the fact that some schools or

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[7] A reviewer of a related submitted article on this topic has suggested that the uneven distribution of children with disabilities, including uneven distribution of severity of disabilities might overwhelm the variation in spending across elementary schools making it difficult to discern the extent that other variation rationally underlies this variation. Two steps could be taken to better sort through this issue. First, one might more specifically disaggregate special education populations by disability type across schools. Our Texas data do not provide such precision, and while the Ohio data provide listings of the disaggregate groups in each school, enrollments are not listed when the total count is less than 10, which involves most cases of children with specific disabilities per school. Alternatively, one might simply pull out the special education program expenditures from each school budget and exclude the special education population variation. This step was feasible with our Texas data but not with our Ohio data. Baker and Arbuckle (2008, available on request) decompose the variance in per pupil spending by disability, poverty and scale in Texas schools. The results do not vary substantively from those herein.

districts on average spend more than necessary to achieve specific outcomes, or how does one account for potential spending inefficiency? And in addition, is it possible that the outcome measure, used as an independent variable, is partly a function of the dependent variable, spending, and also related to other independent variables in the model? That is, the outcome measure might be endogenous.

Previous school-level cost function analyses have not attempted to account for endogeneity of outcomes and have used limited methods to account for variation in efficiency across schools (Baker & Thomas, 2006; Conley & Rooney, 2007). But, an extensive body of district-level cost function research has accounted for endogeneity of outcomes and has used indirect factors related to bureaucratic behavior of local governments as a method of capturing variations in inefficiency across districts (Duncombe & Yinger, 2008). In the present case, the sample of schools across districts within core based statistical areas is in part related to the desire to test the use of approaches from district cost modeling applied to school cost modeling. Previous school-level cost functions applying single stage (no endogenous outcomes), stochastic frontier (efficient cost frontier) models have yielded cost predictions relatively insensitive to student population characteristics and to outcome variation.

Here, I apply a two-stage least squares cost function treating outcomes as endogenous, and I include in the models additional district-level variables attempting to capture variations in spending across schools not associated with variations in outcomes or the costs of improving outcomes—indirect controls for efficiency, which in this context are simply an attempt to address omitted variables bias. Modeled without indirect controls for efficiency, I have a model of spending as a function of an outcome measure and factors associated with the costs of producing that outcome. But the spending measure likely varies across schools within the core based statistical areas as a function of more than just cost factors and desired outcomes. Spending variation neither associated with outcomes nor costs may be considered inefficiency (at least with respect to producing the measured outcomes). For example, spending may vary as a function of differences in the fiscal capacity of districts. Some districts within a core based statistical area may spend more on average across their schools than others, because they can—they have the fiscal capacity to do so. Where these spending differences are not associated with differences in outcomes, they may be considered inefficiencies. As such, one should attempt to account for them in the model. I test a variety of district-level factors to explain spending differences across schools unassociated with outcome differences and generally not considered to be cost factors.

When treating outcomes as endogenous, one must find a set of exogenous instruments that may be used in generating predicted values of the outcome measure in the first-stage regression equation. Those instruments should be sufficiently related to the outcome measure but not related to the spending measure. As with the selection of indirect efficiency controls, instrument selection in education cost function modeling is perhaps more art than science. In the present case, I draw on recent work of Duncombe and Yinger, (2006, 2007a) and focus on characteristics of other elementary schools in the same district which may create pressure on student outcomes in a given school. In modeling district-level costs, Duncombe and Yinger (2006, 2007a) draw on characteristics of other school districts sharing labor markets or legislative districts. To evaluate model instruments, I apply standard statistical tests to evaluate instrument relevance (F-statistic on instruments) and overidentification (Hansen J, p-value), as discussed in Bound, Jaeger, and Baker (1995).

Findings

In this section, I report the findings of the expenditure and cost functions. I begin with an evaluation of the extent to which within-district spending across elementary schools is a predictable function of student population characteristics. Next, I address models of the variation in costs across elementary schools of achieving average state performance outcomes. I conclude this section with graphic, descriptive analysis of the distribution of actual per pupil expenditures across metro area and urban core elementary schools, compared with the marginal costs of providing equal educational opportunity across all schools within each metropolitan area.

Expenditure Function Results

Table 3 summarizes Texas urban core district expenditure functions. For all cities, enrollment size is associated with spending variation, with schools enrolling under 500 or under 300 students spending more on average than larger schools. As noted previously, size-related differences in spending should not necessarily exist within districts because inefficiently small schools should not necessarily exist at the expense of others. Size-related cost variation is greatest in Dallas. Overall, spending variation is least predictable within Dallas. Spending variation is most predictable in Austin and San Antonio. Austin displays the strongest positive relationship between school subsidized lunch rate and per-pupil spending. Houston also displays a positive relationship between spending and subsidized lunch or the predicted at-risk measure, but the magnitude of this relationship is smaller in Houston and overall spending variation is less predictable in Houston than in Austin.

Table 4 displays expenditure models for Ohio districts. In Ohio, Cincinnati displays the least predictable patterns of variation in spending across schools and displays no relationship between subsidized lunch rates and spending. Only disability concentrations explain spending variation across Cincinnati schools. When using the predicted at-risk measure, spending is associated ($p < .10$) with at-risk concentrations in Cincinnati, but spending remains less predictable in Cincinnati than in Cleveland or Columbus. Columbus is the only Ohio city in this study to display a consistent positive relationship between poverty, the at-risk measure, and spending per pupil across elementary schools. Spending variation across Cleveland schools appears largely a function of disability concentration and of school size. As with Cincinnati, spending per pupil in Cleveland is marginally, positively associated with the predicted at-risk measure.

Table 3
Texas district expenditure functions

	Free/reduced lunch		Predicted at-risk index	
Variable by city	Coefficient	*SE*	Coefficient	*SE*
Dallas				
% Disability	0.61	0.59	0.42	0.60
% at-risk	0.10	0.13	-0.25	0.18
Enroll 100 to 300	0.42*	0.11	0.42*	0.11
Enroll 300 to 500	0.33*	0.04	0.31*	0.04
Constant	8.34*	0.12	8.65*	0.18
R^2	.44		.48	
Houston				
% Disability	1.35*	0.24	1.43*	0.24
% at-risk	0.11*	0.03	0.16*	0.04
Enroll 100 to 300	0.20*	0.06	0.20*	0.06
Enroll 300 to 500	0.13*	0.01	0.12*	0.01
Constant	8.40*	0.04	8.39*	0.05
R^2	.52		.56	
Austin				
% Disability	1.74*	0.36	1.84*	0.38
% at-risk	0.24*	0.06	0.24*	0.08
Enroll 100 to 300	0.25*	0.04	0.24*	0.04
Enroll 300 to 500	0.13*	0.03	0.14*	0.03
Constant	8.35*	0.06	8.33*	0.07
R^2	.73		.71	
San Antonio				
% Disability	1.67*	0.37	1.64*	0.37
% at-risk	-0.13	0.14	0.27	0.21
Enroll 100 to 300	0.25*	0.03	0.25*	0.03
Enroll 300 to 500	0.13*	0.02	0.12*	0.02
Constant	8.52*	0.13	8.23*	0.20
R^2	.74		.74	

* $p < .05$
Estimated with robust standard errors clustering schools over time

Table 4
Ohio district expenditure functions

	Free/reduced lunch		Predicted at-risk index	
Variable by city	Coefficient	*SE*	Coefficient	*SE*
Cincinnati				
% Disability	0.72*	0.28	0.60*	0.24
% at-risk	0.02	0.09	0.25**	0.14
Enroll 100 to 300	0.07	0.06	0.05	0.06
Enroll 300 to 500	0.02	0.04	0.03	0.03
Constant	9.04*	0.06	8.91*	0.09
R^2	.32		.37	
Columbus				
% Disability	0.91*	0.08	1.02*	0.09
% at-risk	0.28*	0.06	0.38*	0.10
Enroll 100 to 300	0.24*	0.05	0.26*	0.05
Enroll 300 to 500	0.09**	0.05	0.11*	0.05
Constant	8.73*	0.06	8.63*	0.08
R^2	.76		.73	
Cleveland				
% Disability	2.29*	0.20	2.27*	0.20
% at-risk	2.56	2.43	0.21**	0.11
Enroll 100 to 300	0.14*	0.06	0.13*	0.06
Enroll 300 to 500	0.05*	0.03	0.06*	0.03
Constant	6.57*	2.02	8.53*	0.10
R^2	.83		.84	

* $p < .05$
Estimated with robust standard errors clustering schools over time

Cost Models

Table 5 displays the cost function estimates for Texas school districts. In both models, higher proficiency levels are positively associated with spending but far more sensitive to spending in the model that includes the predicted at-risk measure. I find evidence of school-size related cost variation and also find evidence of relatively strong positive relationships between subsidized lunch and costs and between the predicted at-risk measure and costs. Costs are somewhat more sensitive to the predicted at-risk measure than to subsidized lunch rates, perhaps because the predicted at-risk measure includes school racial composition (see Green, Baker, & Oluwole, 2007). Table 6 displays the Ohio cost model, including only the cost model using the predicted at-risk measure because of lack of variance in subsidized lunch rates in Cleveland. Again, performance outcomes are positively associated with per-pupil spending. As in Texas, holding outcomes constant, per-pupil costs are positively associated with the predicted at-risk measure and positively associated with the proportion of students with disabilities.

Table 5
Texas school-level cost models

	Free/Reduced Model		Predicted at-risk	
Variable	Coefficient	*SE*	Coefficient	*SE*
Potential cost factors				
% proficient (grades 3 & 4)	0.54*	0.21	1.50*	0.63
% disability	1.38*	0.12	1.53*	0.17
% at-risk	0.32*	0.06	0.59*	0.18
Enroll 100 to 300	0.20*	0.03	0.21*	0.04
Enroll 300 to 500	0.13*	0.01	0.16*	0.02
District mean efficiency factors				
Students per school	0.05*	0.02	-0.03	0.03
CBSA enrollment share	0.34*	0.07	0.61*	0.18
Year				
2006	0.01	0.01	-0.02	0.02
2007	0.03*	0.01	-0.003	0.02
CSBA fixed effects				
Austin	-0.003	0.01	-0.03	0.02
San Antonio	0.001	0.01	-0.06**	0.03
Dallas	0.007	0.01	0.009	0.01
Constant	5.50*	0.93	1.60	2.72
Partial F	23.60		5.05	
Hansen J (p-value)	.56		.24	

* $p < .05$
Estimated with robust standard errors clustering schools over time

Table 6
Ohio districts cost model

	At-risk model	
Variable	Coefficient	*SE*
Potential Cost Factors		
% proficient	0.23*	0.11
% disability	1.16*	0.11
% at-risk	0.70*	0.10
Enroll 100 to 300	0.14*	0.02
Enroll 300 to 500	0.06*	0.01
District mean efficiency factors		
% adults with college Education	1.01*	0.05
% aged 5–17	-0.92*	0.23
Year		
2003	-0.06*	0.02
2004	-0.04	0.03
2005	-0.03	0.03
2006	-0.01	0.04
2007	0.03	0.03
CBSA Fixed Effects		
Cleveland	0.01	0.01
Columbus	-0.01	0.01
Constant	8.59	0.06
Partial *F*	12.24	
Hansen *J* (*p*-value)	.36	

* $p < .05$
Estimated with robust standard errors clustering schools over time

Sensitivity Simulations

The following figures present recorded per-pupil spending in 2007 for urban core (green filled triangles) and other elementary schools sharing the same labor market (red hollow circles) by the predicted at-risk measure. The sloped trendline in each figure represents the predicted costs of providing equal opportunity to achieve the average state outcomes (among included schools) from low to high at-risk share. For example, for Texas districts, the predicted per-pupil cost of achieving state mean proficiency rates for a school of 0% predicted at-risk is approximately $4,000, and the predicted cost per pupil of a school nearing 100% at-risk over $6,000 (approaching $7,000 or a 75% difference). Note also that the sloped line cuts roughly through the middle of the plot of all schools, intersecting the plot at the point where average spending and average school characteristics are associated with average outcomes. This slope derived from the cost model is the same for each Texas metropolitan area. What differs is the actual distribution of resources.

In a predictable, need-based expenditure model, elementary schools would fall roughly along the diagonal line or at least parallel to it. That is, within any district the school with 100% at-risk would have about 75% higher per pupil budget than the school with 0% at-risk. Benchmarked against the hypothetical average school with average spending and average outcomes, a school with lower at-risk shares would require less funding to achieve the average outcome, and a school with higher at-risk shares would require more funding. Schools above the diagonal line are those with spending more than what is required for achieving the average outcome, and schools below the line are those with spending less than required for achieving the average outcome.

None of the urban districts in Figure 1 displays a clear pattern of alignment with the projected costs of equal opportunity. The most problematic scenario is one in which surrounding lower-poverty schools that exist in the same labor market for teachers fall well above the need adjustment line, but higher-poverty urban core schools fall below that line. This is clearly the case in the Dallas metropolitan area. Simply reshuffling resources among Dallas elementary schools may place those schools in a pattern parallel to the need-adjusted trendline but cannot simultaneously raise them to that line to provide equal opportunity with surrounding schools. That is, one might create more equal opportunity *within* Dallas schools to achieve Dallas's own average outcome level, but one could not reorganize existing resources among these schools to provide equal opportunity to achieve the state mean outcome. Meanwhile, all elementary schools with less than 20% at-risk in the Dallas metropolitan area have per-pupil budgets above the needs-adjusted trendline. Austin and Houston labor markets are less problematic, but they still include substantial numbers of lower-poverty neighbors spending above the needs-adjusted trendline and higher-poverty urban core schools falling below the needs-adjusted trendline. In both districts, however, lower poverty elementary schools—those with 20% to 80% at-risk—are somewhat aligned with the need-adjusted trendline.

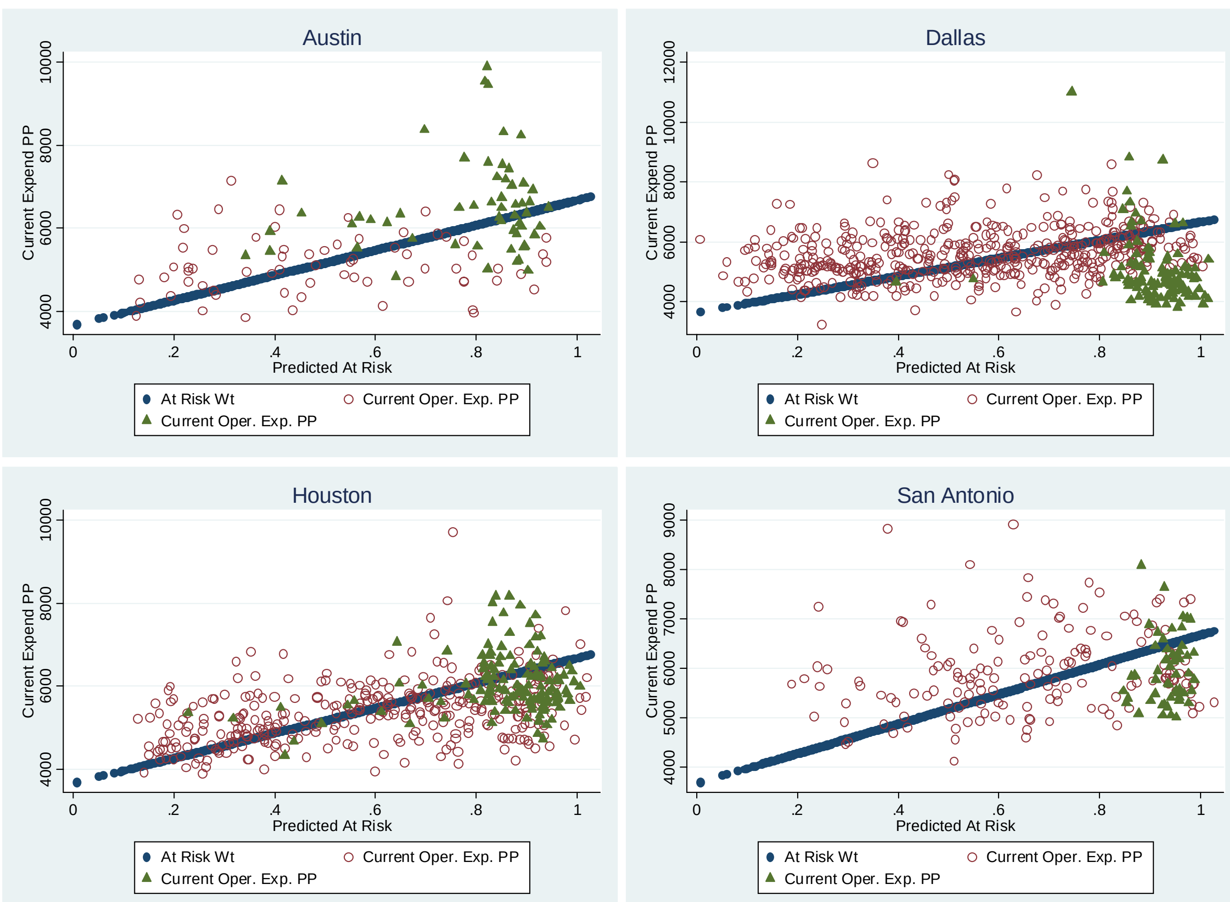

Figure 1. Texas simulated marginal at-risk costs.

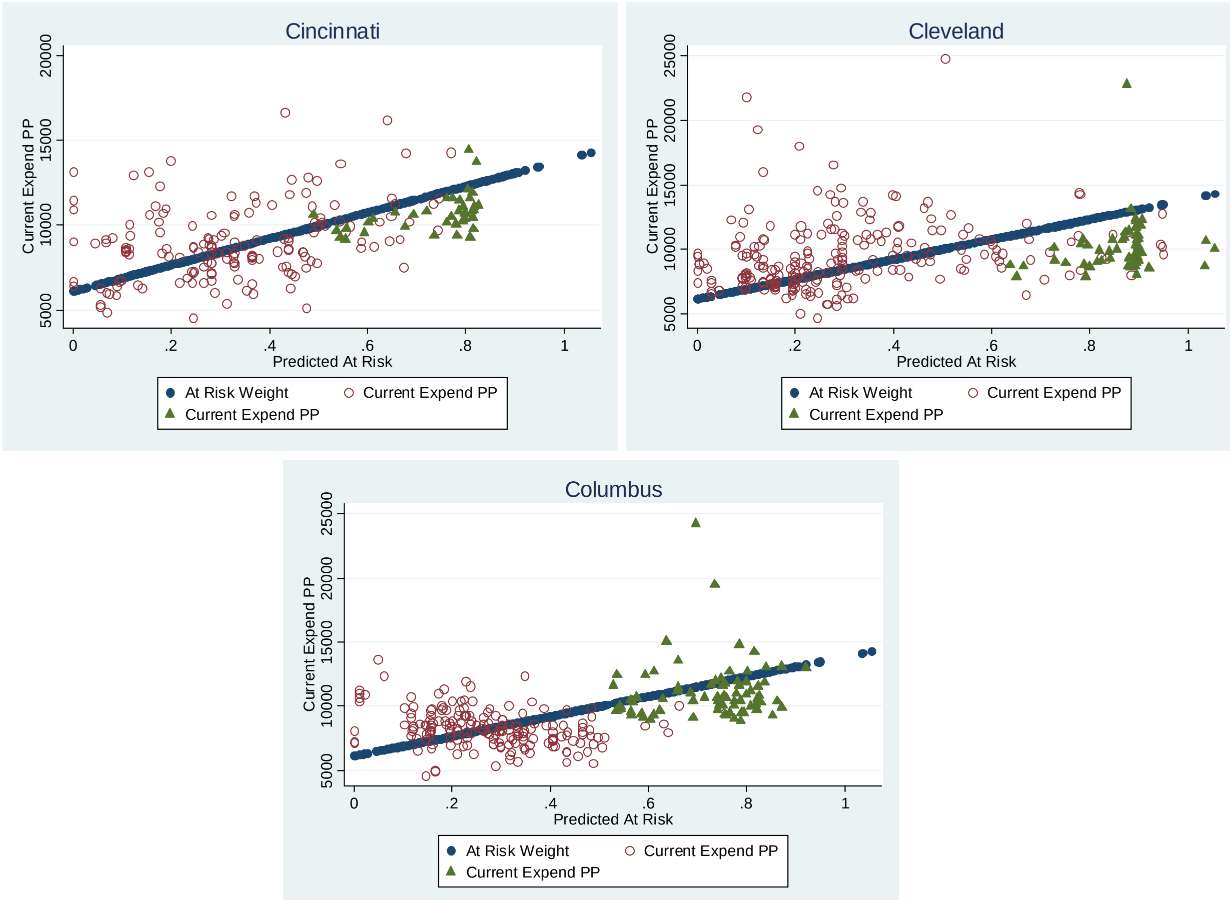

Figure 2. Ohio simulated at-risk marginal costs

Cleveland and Cincinnati schools are both surrounded by many higher-spending schools, with most schools in both urban core districts falling below the needs-adjusted trendline. As in Dallas, internal reallocation can lead only to greater equality of opportunity to achieve the districts' internal (lower-average) outcome level. That is, if one reshuffles within the same budget constraint, all Dallas schools will fall below the diagonal line even if they run parallel to it. In the present analysis, I do not consider whether the Dallas school district has access to other resources, perhaps presently allocated to secondary schools, to level up elementary schools.

As in Dallas, the lowest-need schools within Cincinnati and Cleveland would end up being funded well below spending levels of neighbors having much lower at-risk shares. Columbus schools may be best positioned relative to their own labor market to provide per-pupil spending aligned with the trendline. Interestingly, in the Columbus Core Based Statistical Area, schools outside of Columbus city but with at-risk shares over 40% are disadvantaged. Among non-Columbus city schools, higher poverty elementary schools appear to have systematically lower per pupil budgets.

Finally in Table 7, I use the at-risk cost adjustment represented in the previous figures to recalculate coefficients of variation on cost-adjusted (accounting for at-risk populations but not school size) per-pupil expenditures across schools within each district. Within Texas, Houston fares well compared with Dallas and Austin, though Austin displayed the most consistent positive relationship between per-pupil spending and poverty. However, San Antonio has the least amount of variation in cost-adjusted per-pupil spending. In Ohio, Cincinnati fares significantly better than either Columbus or Cleveland with regard to cost-adjusted variation in resources across schools, though Columbus displays more predictable targeting of funding with respect to at-risk students.

Table 7
Coefficients of variation for at-risk cost adjusted per pupil expenditures

City	At-risk adjusted coefficient of variation
Texas	
Austin	0.16
Dallas	0.21
Houston	0.12
San Antonio	0.11
Ohio	
Cincinnati	0.09
Cleveland	0.16
Columbus	0.17

Conclusion

Overall, spending was more predictable and positively associated with poverty and at-risk measures in Columbus and Austin, not in Cincinnati and Houston, both of which use Weighted Student Funding. But in terms of cost-adjusted variations in resources, both Cincinnati and Houston fared well, with Cincinnati displaying greater within-district cost-adjusted equity than other Ohio cities, and Houston displaying comparable within-district equity to San Antonio and better than either Dallas or Austin. I also found it feasible to apply a two-stage least squares cost function across schools with indirect controls for efficiency by using same-grade schools throughout a metropolitan area spanning district boundaries. Additional analyses are required to determine the stability of marginal cost estimates for children in poverty, children with disabilities, and other potential student populations. While earlier single-stage, stochastic frontier models in Washington and Hawaii produced relatively modest marginal costs for children in poverty (around 40%), the models herein are more consistent with cross-district poverty-related marginal cost estimates, on the order of 75% to 100% in additional costs from the school with 0% at-risk to the school with 100% at-risk. Where sufficient school-level financial, demographic, and outcome data are available, as in Ohio and Texas, it may well be feasible to use two-stage least squares cost function models to guide within-district, cross-school budget setting.

Evaluation of marginal costs and current spending distributions across all schools within metropolitan labor markets reveals significant constraints for some large urban districts in the samples. While it may technically be possible, in a purely relative sense it may be very difficult for less-well-funded urban core districts to reshuffle their resources across schools. Solutions to within-district resource allocation must take into account and be addressed simultaneously with between district allocation. I remain unconvinced that the data make a strong case one way or the other for weighted student funding as a district budgeting method to achieve greater rationality in cross-school expenditures. Districts not using weighted funding appear comparably able to target resources to schools with greater student needs. While cross-school equity is a compelling reason to consider adopting weighted student funding, there may be other important considerations as well.

In the fall of 2007, as New York City was beginning implementation of *Fair Student Funding,* Seattle Public Schools—the model for many others that followed—announced that it would abandon weighted student funding, noting that over time, the formula had evolved to become too complex and cumbersome for school-level personnel to administer, and the decentralized governance strategy made it "difficult to develop carefully coordinated strategies between the District and schools" (Seattle Public Schools, 2007, p. 1). Even the other espoused virtues of weighted funding—simplicity and transparency—may not be all that pundits have argued. Nonetheless, within-district equity in the distribution of resources remains a serious concern and one that requires continued attention, regardless of budgeting methods employed. In ongoing research, we are exploring financial resource distributions and teacher distributions across schools within large districts in multiple states to identify districts that successfully target financial resources across schools according to needs and costs, and those districts that have more equitable distributions of teacher qualifications across schools. Next, we intend to determine how they got that way and uncover district practices and budgeting strategies that lead to greater equity, rather than taking the approach of more recent advocacy research which identifies the politically motivated solution then seeks to prove that it works.

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Appendix

Texas At-Risk Index Model

Variable	Coefficient	*SE*
School population		
% Hispanic	0.68*	0.01
% Black	0.67*	0.01
% ELL	0.22*	0.02
District characteristics		
Median family income (natural log)	-0.17*	0.01
% adults with college education	-0.18*	0.03
Year		
2006	0.004	0.004
2007	-0.001	0.004
Core Based Statistical Area		
San Antonio	-0.02*	0.01
Houston	-0.02*	0.004
Austin	0.01**	0.01
Constant	2.04	0.13
R^2	.87	

* $p < .05$, ** $p < .10$

Ohio At-Risk Index Model

Variable	Coef.	Std. Err.
School population		
% Hispanic	0.73*	0.04
% Black	0.37*	0.01
District characteristics		
Median family income (natural log)	-0.67*	0.02
% adults with college education	0.09*	0.04
Year		
2003	0.14*	0.01
2004	0.15*	0.01
2005	0.16*	0.01
2006	0.19*	0.01
2007	0.18*	0.01
Core Based Statistical Area		
Cleveland	-0.05*	0.01
Columbus	-0.01	0.01
Constant	7.07	0.25
R^2	.73	

* $p < .05$, ** $p < .10$

About the Author

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