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Evaluating the Recession's Impact on State School Finance Systems

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Abstract: The Great Recession's effect on state school finance systems was unlike previous downturns in the early 1990s and early 2000s in that it a) involved a greater loss of taxable income in many states, thus greater loss to state general fund revenues, b) also involved a substantial collapse of housing markets and related reduction or at least leveling of growth of taxable property wealth, c) but also involved a substantive infusion of federal "fiscal stabilization" aid to be used to fill holes in state general aid formulas. The goal of this study is to evaluate the effects of the recession on equity of state school funding systems with respect to child poverty concentrations. Using school district level panel data from 1993 to 2011, we evaluate the interplay between local, state and federal source revenues through the course of the recent recession by comparison with the less severe economic downturn of the early 2000s. Then using state level estimates of elasticities between revenue and spending measures and district poverty rates, we estimate whether changes in the distribution of state, local or federal revenue contribute most to changes in overall equity of current spending and whether those contributions changed during the recent recession.
Keywords: school funding; fiscal stabilization; recession; poverty; equity

Evaluando el impacto de la recesión en los sistemas estatales de financiamiento educativo
Resumen: El efecto de la Gran Recesión en los sistemas estatales de financiamiento educativo fue

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diferente a las crisis anteriores en la década de 1990 y principios de 2000, ya que a) implicó una mayor pérdida de renta imponible en muchos estados, por lo tanto una mayor pérdida de ingresos del fondo general, b) también implicó una caída sustancial de los mercados de vivienda y la reducción relacionada o, al menos, la nivelación del crecimiento de la riqueza propiedad imponible, c), también involucró una infusión sustantiva de ayuda federal para la "estabilización fiscal" que se utilizó para cubrir déficits en las fórmulas generales de sobre de los presupuestos estatales. El objetivo de este estudio es evaluar los efectos de la recesión en la equidad de los sistemas de financiación de escuelas estatales en relación a las áreas de concentración de pobreza infantil. Utilizando datos de panel a nivel de distrito escolar 1993-2011, se evalúa la interacción entre los ingresos de fuentes locales, estatales y federales a través del curso de la reciente recesión en comparación con la crisis económica de la década de 2000 que fue menos severa. Luego, utilizando estimaciones a nivel estatal de las elasticidades entre las medidas de ingresos y de gastos y los índices de pobreza del distrito, se estimó si más cambios en la distribución de ingresos estatales, locales o federales contribuyen a los cambios en el patrimonio neto total del gasto corriente y si esas contribuciones cambiaron durante la reciente recesión.
Palabras clave: financiamiento escolar; estabilización fiscal; recesión; pobreza; equidad.

Avaliando o impacto da recessão sobre os sistemas de financiamento da educação do estado

Resumo: O efeito da Grande Recessão nos sistemas estaduais de financiamento da educação foi diferente das crises anteriores na década de 1990 e início de 2000, porque: a) envolveu uma maior perda de rendimentos tributáveis em muitos estados, porém maior perda de receitas de fundos gerais, b) também significou uma queda substancial no mercado imobiliário e a redução relacionada ou, pelo menos, igualação do crescimento da propriedade tributável, c), também involucro uma infusão substancial de ajuda federal para "estabilização fiscal" que foi usada para cobrir déficits nas fórmulas gerais dos orçamentos estaduais. O objetivo deste estudo é avaliar os efeitos da recessão sobre a equidade do financiamento das escolas estaduais em relação às áreas de concentração de pobreza infantil. Usando dados de painel para 1993-2011 a nível de distrito escolar, se avalia a interação entre os rendimentos de fontes locais, estaduais e federais ao longo da recente recessão em comparação com a crise econômica da década de 2000 que foi menos severa. Em seguida, usando estimativas a nível de Estado das elasticidades entre as medidas das receitas e despesas e as taxas de pobreza nos distritos foi estimado se mais mudanças na distribuição dos ingressos estaduais, locais ou de renda federal contribui para mudanças no total das despesas correntes e se estas contribuições contribuíram a alterações durante a recente recessão.
Palavras-chave: financiamento escolar; estabilização fiscal; recessão; pobreza.

Introduction

The economic downturn's effect on state school finance systems was unlike previous downturns in the early 1990s and early 2000s in that it a) involved a greater loss of taxable income in many states, thus greater loss to state general fund revenues, b) also involved a substantial collapse of housing markets and related reduction or at least leveling of growth of taxable property wealth (Dadayan, 2012), c) but also involved a substantial infusion of federal "fiscal stabilization" aid to fill holes in state general aid formulas (Sciarra, Farrie, & Baker, 2010). Unfortunately, however, that federal aid infusion was short-lived and many states, within two years, were left with persistent aid gaps in their general aid formulas.

The economic downturn also ushered in a new era of austerity rhetoric among state politicians, across blue and red states and on both sides of the political aisle, at least by formal party delineation. In the face of recent (2014) legal challenges to New York's school funding formula, Democratic Governor Andrew Cuomo proclaimed:

> "We spend more than any other state in the country," he said. "It ain't about the money. It's about how you spend it – and the results."[1]

Florida Governor Rick Scott, in justifying his 2011 cuts to the state's education budget, remarked:

> "We're spending a lot of money on education, and when you look at the results, it's not great."[2]

In Ohio, Robert Sommers, chief education advisor to Governor Tom Kasich declared:

> "In the last decade, we've spent more money but have not gotten any better result."[3]

And in an interview with New Jersey's Governor Chris Christie, the *Wall Street Journal* reported:

> "According to Mr. Christie, New Jersey taxpayers are spending $22,000 per student in the Newark school system, yet less than a third of these students graduate, proving that more money isn't the answer to better performance."[4]

The ongoing press for austerity in state and local finance systems means that the cuts to state school finance systems inflicted during the downturn are less likely to be immediately restored as the economy rebounds. The cuts of the economic downturn may, as a result, be permanent. The most recently available federal data on district level finances run through school year 2010-11, giving us some glimpse into the impact, across states of the economic downturn which began around 2008. The goal of this study is to evaluate the effects of the recession on equity of state school funding systems with respect to child poverty concentrations. In addition, the goal is to determine the relative role of state and local revenue sources, their amounts and distributions over time, at influencing changes in school funding equity over time.

Do School Finance Reforms 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. 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).

Evaluating whether state school finance systems, or reforms to those systems lead to increases in spending generally, or targeted to children from economically disadvantaged backgrounds is of little relevance in the absence of evidence supporting effectiveness of such reforms. 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

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[1] http://blogs.wsj.com/metropolis/2014/02/11/cuomo-on-education-funding-lawsuit-it-aint-about-the-money/

[2] http://blogs.orlandosentinel.com/news_politics/2011/10/scott-anthropology-and-journalism-dont-pay-and-neither-do-capes.html

[3] http://www.norwalkreflector.com/content/deal-it-schools-can-adjust-cuts-kasich-education-official-tells-lawmakers

[4] http://online.wsj.com/article/SB10001424052702303348504575184120546772244.html

levels leads to a narrowing of test score outcomes across family background groups" (p. 49). Jackson, Johnson and Persico (2014) use data from the Panel Study of Income Dynamics (PSID) to evaluate long term outcomes of children exposed to court-ordered school finance reforms, based on matching PSID records to childhood school districts for individuals born between 1955 and 1985 and followed up through 2011. They find that the "Effects of a 20% increase in school spending are large enough to reduce disparities in outcomes between children born to poor and non-poor families by at least two-thirds," and further that "A 1% increase in per-pupil spending increases adult wages by 1% for children from poor families" (p. 42).

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. Most recent peer reviewed studies of state school finance reforms have applied longitudinal analyses within specific states. And several such studies provide compelling evidence of the potential positive effects of school finance reforms. 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). Similarly, 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" (Papke, 2001, p. 821).[5] Deke (2003) evaluated "leveling up" of funding for very-low-spending districts in Kansas, following a 1992 lower court threat to overturn the funding formula (without formal ruling to that effect). The Deke article found that a 20% increase in spending was associated with a 5 percent increase in the likelihood of students going on to postsecondary education (p. 275).

Three studies of Massachusetts school finance reforms from the 1990s find similar results. The first, a non-peer-reviewed report by Downes, Zabel, and Ansel (2009) explored, in combination, the influence on student outcomes of accountability reforms and changes to school spending. It found that "Specifically, some of the research findings show how education reform has been successful in raising the achievement of students in the previously low-spending districts" (p. 5). The second study, an NBER working paper by Guryan (2001), focused more specifically on the redistribution of spending resulting from changes to the state school finance formula. It 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. 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).[6] The most recent, by Nguyin-Hoang &

[5] In a separate study, Leuven and colleagues (2007) attempted to isolate specific effects of increases to at-risk funding on at risk pupil outcomes, but did not find any positive effects.

[6] While this paper remains an unpublished working paper, the advantage of Guryan's analysis is that he models the expected changes in funding at the local level as a function of changes to the school finance formula itself, through what is called an instrumental variables or two stage least squares approach. Then, Guryan evaluates the extent to which these policy induced variations in local funding are associated with changes in student outcomes. Across several model specifications, Guryan finds increased outcomes for students at Grade 4 but not grade 8. A counter study by the Beacon Hill Institute suggest that reduced class size and/or increased instructional spending either has no effect on or actually worsens student outcomes (Jaggia & Vachharajani, 2004).

Yinger (2014) also found that "changes in the state education aid following the education reform resulted in significantly higher student performance" (p.297).

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).[7] 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).

Indeed, this point is not without some controversy, much of which is easily 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 (see Baker & Welner, 2011).[8] Hanushek and Lindseth (2009) use 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.[9] Greene and Trivitt (2008) present a study in which they claim to show that court

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[7] Two additional studies of school finance reforms in New Jersey also merit some attention in part because they directly refute findings of Hanushek and Lindseth and of the earlier Cato study and do so with more rigorous and detailed methods. The first, by Alex Resch (2008) of the University of Michigan (doctoral dissertation in economics), explored in detail the resource allocation changes during the scaling up period of school finance reform in New Jersey. Resch found evidence suggesting that New Jersey *Abbott* districts "directed the added resources largely to instructional personnel" (p. 1) such as additional teachers and support staff. She also concluded that this increase in funding and spending improved the achievement of students in the affected school districts. Looking at the statewide 11th grade assessment ("the only test that spans the policy change"), she found: "that the policy improves test scores for minority students in the affected districts by one-fifth to one-quarter of a standard deviation" (p. 1). Goertz and Weiss (2009) also evaluated the effects of New Jersey school finance reforms, but did not attempt a specific empirical test of the relationship between funding level and distributional changes and outcome changes. Thus, their findings are primarily descriptive. Goertz and Weiss explain that on state assessments achievement gaps closed substantially between 1999 and 2007, the period over which Abbott funding was most significantly scaled up. Goertz and Weiss further explain: "State Assessments: In 1999 the gap between the Abbott districts and all other districts in the state was over 30 points. By 2007 the gap was down to 19 points, a reduction of 11 points or 0.39 standard deviation units. The gap between the Abbott districts and the high-wealth districts fell from 35 to 22 points. Meanwhile performance in the low-, middle-, and high-wealth districts essentially remained parallel during this eight-year period" (Figure 3, p. 23).

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

[9] 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

ordered school finance reforms led 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. 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.

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. Further, it stands to reason that if positive changes to school funding have positive effects on short and long run outcomes both in terms of level and distribution, 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, the effects on long term student outcomes being several years down the line. It is also important to understand the features of state school finance systems including balance of revenue sources that may make these systems particularly susceptible to economic downturn.

How Should We Measure School Finance Reform?

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 (Berne & Stiefel, 1984). Policy emphasis was on reducing the variance in spending inputs to schooling generally and disrupting the relationship between local taxable property wealth, family income and spending (fiscal neutrality) in particular. Commonly used measures of variance include ranges, range ratios and coefficients of variation. Commonly used measures of fiscal neutrality included correlations and regression coefficients between wealth, income and per pupil spending measures. These measures still find their way into many reports of school funding equity including Education Week's *Quality Counts.*[10]

A major shortcoming of traditional equity indicators is that they fail to parse the "inequitable" variations and "equitable" variations in per pupil resources. Those "equitable" variations are variations in resources intended to accommodate differences in educational needs and costs, including differences in student populations, labor costs and such factors as population

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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, Walber, 2006).

[10] http://www.edweek.org/media/16qc-schoolfinancec1.pdf

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. As commonly applied, traditional equity measures fail to sort out equitable variation from inequitable variation, often leading to erroneous conclusions.[11]

Conceptions of equity in school finance have evolved over the decades, and so to have funding formula mechanisms for improving equity and methods for evaluating those efforts (Baker & Green, 2008, 2014; Baker, Sciarra, & Farrie, 2012; Duncombe & Yinger, 2008). The most significant shift has been from evaluating equity in terms of nominal dollar inputs to schooling, to viewing equity in terms of providing children regardless of their educational settings or personal backgrounds, equal opportunity to achieve common outcome goals (Baker & Green, 2008, 2014). Achieving common outcome goals requires appropriate differentiation of spending inputs to account for differences in the costs of achieving those outcome goals (Duncombe & Yinger, 2008). Among the more commonly acknowledged factors influencing the costs of achieving common outcomes are district or school characteristics such as economies of scale, population sparsity and local labor market conditions, and student population characteristics such as local concentrations of child poverty and numbers of children who are limited in their English language proficiency or have specific disabilities (Duncombe & Yinger, 2008). State school finance systems, and in some cases local district budgeting models have evolved to include factors to account for these cost differences. But these models are necessarily a result of political deliberations and rarely fully accommodate differences in costs of serving needy children, and often include numerous political tradeoffs to achieve adoption (Baker, 2009; Baker & Green, 2005).

Ideally, to evaluate whether a state school finance system provides for equal opportunity to achieve desired outcomes, one would know or be able to estimate with reasonable precision, the costs of achieving common outcomes across children, schools and districts. One could then use these cost adjustments to evaluate whether actual spending is sufficiently adjusted. Others have applied this approach to state specific analyses (Duncombe & Yinger, 1998; Reschovsky & Imazeki, 2004). But this approach is implausible to apply across states due to vast differences in state outcome standards and the assessments by which they are measured. Adoption of common standards and assessments may, down the line, increase our ability to estimate cross-state cost variation of achieving common standards (see Baker, Taylor, & Vedlitz, 2008).

Alternatively, given the lack of common outcome measures, one might regress per pupil spending as a function of cost factors to determine whether spending variation across schools or districts varies at all with respect to cost factors. Baker, Sciarra and Farrie (2009, 2012, 2014) use a regression based approach to determine the extent that state and local revenues per pupil vary, across districts, across states, with respect to child poverty concentrations, controlling for competitive wage variation, economies of scale and population density. Others have applied similar approaches to evaluate the sensitivity of school site budgets to student characteristics (Ajwad, 2006; Baker 2009, 2012; Chambers, Levin, & Shambaugh 2010; Levin et al., 2013). The goal of these regression-based methods is to determine the relationship between variation in poverty concentrations across schools or districts and availability of financial resources, controlling for exogenous cost pressures. That is, how much more or less funding is available in higher versus lower poverty settings, after accounting for differences in costs?

[11] For example, Education Week's *Quality Counts* report finds greater variation in per pupil spending in New Jersey than in New York, and thus assigns New Jersey a lower grade for equity. But as our models show, New Jersey's district spending variation is a direct result of targeting additional funds to higher need districts and New York's lack of variation is a function of not targeting additional resources to higher need districts.

Goals of this Study

The goal of this study is to evaluate the effects of the recent recession on equity of state school funding systems with respect to child poverty concentrations, statistically evaluated using models comparable those estimated in Baker, Sciarra and Farrie (2010, 2012, 2014). That is, the goal is to evaluate the overall level and relative progressiveness of various revenue components of local public school districts and of current operating expenditures. As explained in *Is School Funding Fair,* a progressive system is one where combined state and local revenue per pupil is positively associated with poverty concentration – that is, one where higher poverty concentration districts have marginally more state and local revenue per pupil than do lower poverty districts.

In addition to evaluating funding fairness overall, this study attempts to get under the hood of funding fairness across states, determining which revenue sources more strongly influence shifts in funding fairness over time. Prior reports have indicated that the amount or share of state aid allocated is not always a strong determinant of funding fairness, though it seems that increased state support should lead to improved fairness (Baker & Corcoran, 2012). Baker and Corcoran (2012) showed that state school finance systems often allocate state aid in ways that reinforces or even exacerbates inequities.

Questions addressed in this paper are as follows:

1) What is the interplay, over time and across states, between state aid and local revenues?
    a. Does that interplay differ for lower and higher poverty districts within states?
    b. Does that interplay differ during the recent economic downturn when compared with the complete panel (1993 – 2011) or earlier downturn (1999 to 2003)
    c. Are there important lagged structures to that interplay?
2) How does the level and distribution of federal, state and local revenue with respect to poverty influence the distribution of current operating expenditures per pupil with respect to poverty across districts within states?
    a. Does that relationship differ during the recent economic downturn when compared with the complete panel (1993 – 2011) or earlier downturn (1999 to 2003)
    b. Are there important lagged structures to that interplay?
3) How many states saw substantive declines in funding fairness from 2009-2011? And to what magnitude?

I begin by evaluating the interplay between levels of federal, state and local revenues across states over time, exploring the extent to which state aid increases are accompanied by local revenue decreases and whether local revenues increase in response to state aid decreases. I explore whether these shifts occur differently a) during different recession and growth periods and b) across higher versus lower poverty school districts. I also test the possibility that changes in revenues by source have lagged effects. For example, that state aid cuts not only in current but prior recent years, lead to increases in local revenue, which may compromise equity.

Next, I explore the progressiveness/regressiveness of various revenue sources, across states over time. I evaluate whether and to what extent changes to the progressiveness of federal, state or local revenues affect changes to the progressiveness of current operating expenditures across school districts within states. I also explore whether the relative influence of each revenue source on spending "fairness" differs over different time periods. That is, across states and for each state, which revenues seem to most strongly influence fairness? Do increases in local revenue levels and the typical patterns of unfairness of local revenues drive increased inequity? Do increases in state aid coupled with increases in progressive targeting in state aid drive changes in spending fairness. Again,

as well as characterizing contemporaneous (same year) changes, I explore lagged effects. I conclude with a summary of states that have experienced declining funding fairness through the most recent economic recession.

Methods

Models herein use annual data on local public school district revenue and expenditure from the U.S. Census Bureau's fiscal survey of local governments (F-33) along with annual data on school and student population characteristics from a) the National Center for Education Statistics Common Core of Data, public education agency universe survey and public school universe survey and b) the U.S. Census Bureau special tabulation Small Area (school district) Income and Poverty Estimates. Finally, I use the education comparable wage index (Taylor & Fowler, 2006) to account for macro level differences in labor market variation in wages across local public school districts within states. Specifics on data sources and years, including imputations are provided in Appendix A.[12]

Estimating Models of the Interplay between District Level Revenue Sources

For the first analysis, to discern the relationship between local, state and federal revenues and how that relationship varies across lower and higher poverty local public school districts within states, I estimate models to a 19-year panel of district level data. The goal of these models is to characterize the patterns of relationship *in the same year* between local tax revenues and state aid. I test the relationship between the natural log of local tax revenue per pupil and state aid per pupil (natural logged) and federal aid per pupil (natural log).

$$\text{Eq1: } LREV_{sdt} = f(STAID_{sdt} \times STATE, FEDAID_{sdt} \times STATE, Enrollment_{sdt}, ECWI_{sdt})$$

Where LREV is local revenue per pupil for each state (s), district (d) and year (t), STAID is state aid per pupil for each state (s), district (d) and year (t), and FEDAID is federal aid per pupil for each state (s), district (d) and year (t). The model includes controls for changes in enrollment (district level) and regional variation in competitive wages (ECWI).

I estimate fixed effects models of within district revenue changes over time. That is, within districts over time, do changes in federal or state aid coincide with changes in local revenue? Interaction terms are used to generate state specific estimates of local tax revenue changes in response to changes in state aid. I report these fixed effects estimates for the entire panel 1993 to 2011 and for two separate time periods of economic downturn as reflected in significant dips in tax revenues – from 2001 to 2005 and from 2007 to 2011.

The expectation is that increased state aid provides local public school districts the opportunity to either reduce local effort or at least to increase local effort more slowly. It is also assumed that the ability to raise additional local revenue depends on local fiscal capacity and that districts serving higher need populations may have lower local fiscal capacity. However, it is also likely that given school district organizational differences and varied policy constraints including

[12] My intent here is account for exogenous wage variation which broadly affects labor costs (the largest component of school spending). Additionally, the ECWI includes an inflation component and is available annually from 1997 to 2011. An alternative approach yielding largely similar results involves including labor market dummy variables such that slopes of revenues with respect to poverty are characterized *within labor markets*. Other wage adjustment conceptions, like *hedonic wage models,* which attempt to adjust at the school district level to account for working conditions are less appropriate here for a variety of reasons, most notably that we are trying to capture separately the extent to which state and local revenues are sensitive to poverty, wherein compensating differentials are a portion of poverty related costs. We prefer to retain these differentials, to the extent they exist, in the poverty slope as part of our measure of cross district equity.

differently imposed tax and expenditure limits, local responses with respect to variation in poverty across districts will vary across states. In some states, more than others, higher poverty districts may be hamstrung and unable to raise additional local revenues to compensate for lagging state aid, which in turn may exacerbate inequities in periods of state aid reduction.

To lay groundwork for understanding cross state variation in these relationships, I test the relationship between local tax revenue and state and federal revenues across states for a) all districts statewide, b) high poverty districts (highest quintile within state), and c) low poverty districts (lowest quintile within state). To the extent that the negative coefficient between state aid and local revenue is greater for less poor districts (stronger local revenue response to state aid reduction), cuts to state aid may be more harmful to poorer districts.

Generating State Level Predicted Spending Levels & Progressiveness Ratios

The next step is to generate "fairness" or "progressiveness" indicators for each state for each year as well as predicted revenue and spending levels for each state and year, holding constant other factors. The progressiveness indicators and predicted values are estimated for current expenditures per pupil, for combined state and local revenues per pupil and for each revenue component (state, local, federal). To generate the fairness indicators, I estimate the following regression for each individual year of the 19-year district level panel.

$$\text{Eq2: Revenues (or Spending) per Pupil}_{dst} = f(\text{Scale}_{dst}, \text{Competitive Wage}_{Lt}, \text{State x Poverty}_{dst})$$

In each case, the revenue or expenditure measure is expressed in per pupil terms (and natural log), for each school district (d) in state (s) in year (t) (where approximately 13,000 districts per year include complete data). Economies of scale is expressed in enrollment categories to capture a step down effect in spending variation as a function of district enrollment size, where districts enrolling over 2,000 pupils are considered to be of efficient scale (see Andrews, Duncombe & Yinger, 2002). Competitive wage refers to the Taylor competitive wage index[13] which is applied at the labor market level to individual districts. And poverty refers to the U.S. Census Small Area Income and Poverty Estimates.

The models are used to generate predicted values of each dependent variable, at 0%, 10%, 20% and 30% U.S. Census Poverty rates. The fairness indicator is the ratio of the predicted value at 30% poverty to the predicted value at 10% poverty, holding constant district size (over 2,000) and the competitive wage index at the *within year mean.*

$$\text{Eq3: Fairness} = \frac{\text{Predicted Value 30\% Poverty}}{\text{Predicted Value 10\% Poverty}}$$

The goal is to generate an easily interpreted "slope" of the relationship between a common poverty measure and state and local revenues, for reasonable comparison across states. Census poverty rates within and across states tend to fall between 0% and 30%, wherein a 30% Census poverty rate (under the 100% income threshold for poverty) is often aligned with an 80% to 90% rate of children qualified for free or reduced priced lunch under the National School Lunch Program.[14] Distribution of district poverty rates in Appendix B.

[13] http://bush.tamu.edu/research/faculty/Taylor_CWI/

[14] For a state by state mapping of Census Poverty rates to subsidized lunch rates, see Appendix A: http://schoolfundingfairness.org/National_Report_Card_2014.pdf

Predicted revenue or spending levels per pupil are the predicted values for each dependent measure at 10% Census Poverty, holding constant district size (over 2,000) and the competitive wage index at *the within year mean*. Thus, trends are reported in current (not constant) dollars. I take this step in part because of the difficulty in identifying the "right" deflator for public service expenditure and the deceptive result that follow – either that education spending has or has not risen with respect to inflation, depending on the chosen deflator. Rather, the goal herein is to evaluate when and where the trends change, whether expressed in constant or current dollars.

The end result of this step of the analysis is a 19 year panel of a) predicted revenue and spending levels at 10% poverty and b) fairness ratios for each revenue or spending measure. With this state level panel, I am able to evaluate long term trends in revenues and spending and to evaluate which revenue sources, by level or fairness, to determine which are the strongest drivers of current expenditure fairness across local public school districts.

Determining the Relative Influence of Revenue Sources on Spending Equity

The next step is to use the 50 state (+ DC) 19-year panel of revenue and spending level and fairness indicators to evaluate the drivers of spending fairness over time. To conduct this evaluation, I estimate the following model:

$$\text{Eq4: CUREXPP\_f}_{st} = f(\text{LREV\_f}_{st}, \text{STAID\_f}_{st}, \text{FEDAID\_f}_{st}, \text{LREV\_l}_{st}, \text{STAID\_l}_{st}, \text{FEDAID\_l}_{st})$$

Where CUREXPP_f, LREV_f, STAID_f and FEDAID_f are the fairness ratios (f) for each funding measure and LREV_l, STAID_l and FEDAID_L are the predicted revenue levels ("l" at 10% poverty) for each measure in state "s" at time "t."

For exploratory purposes, I estimate models of between state difference (between effects), within state over time differences (fixed effects) and random effects (combining the two). The fixed effects model is of primary interest and tells us whether year-over-year changes in levels of revenue by source, or fairness of those revenues are associated with changes in spending fairness. That is, do increases in state aid or local revenue increase fairness? Does increased targeting of state aid by poverty (fairness of state aid) lead to increased spending fairness as one would expect? Finally, are the fixed effects different in the most recent economic downturn than a) over the entire 19 year panel or b) over the previous economic slowdown of the early 2000s.[15] The between state model reveals the extent to which states with higher levels of specific revenues or more fair distributions of revenues by source have more fair spending distributions.

Findings & Discussion

I begin with an overview of the interplay between federal, state and local revenue sources over time across states from 1993 to 2011. I also report the within state fixed effects, over time between changes in state aid and changes in local revenue, for all districts, high poverty districts and low poverty districts. Next, I summarize predicted spending levels and trends in funding fairness (current spending and state and local revenue). Next, I evaluate first nationally and then by state the relationship between revenue changes over time and spending fairness changes over time, within which I also explore whether the most recent economic down turn exhibits different patterns than

[15] See Figure2: http://www.rockinst.org/pdf/government_finance/2012-07-16-Recession_Local_%20Property_Tax.pdf

the full panel, or prior downturns. I conclude with a summary of states experiencing the most significant declines in spending progressiveness over the period from 2009 to 2011.

The Interplay between Revenue Sources

Figure 1 summarizes trends in federal, state and local revenue, based on predicted values for these revenue sources for scale efficient districts in an average cost labor market with 10% children in poverty. Notably, partly because these estimates are for districts with relatively low poverty level, the role of federal aid is relatively small. For several states, one can see a small bump in federal aid around 2009, which is likely driven by the introduction of Fiscal Stabilization Aid under the American Recovery and Reinvestment Act. Fiscal stabilization aid was meant to substitute for lost state general fund revenues used to support state general aid formulas.

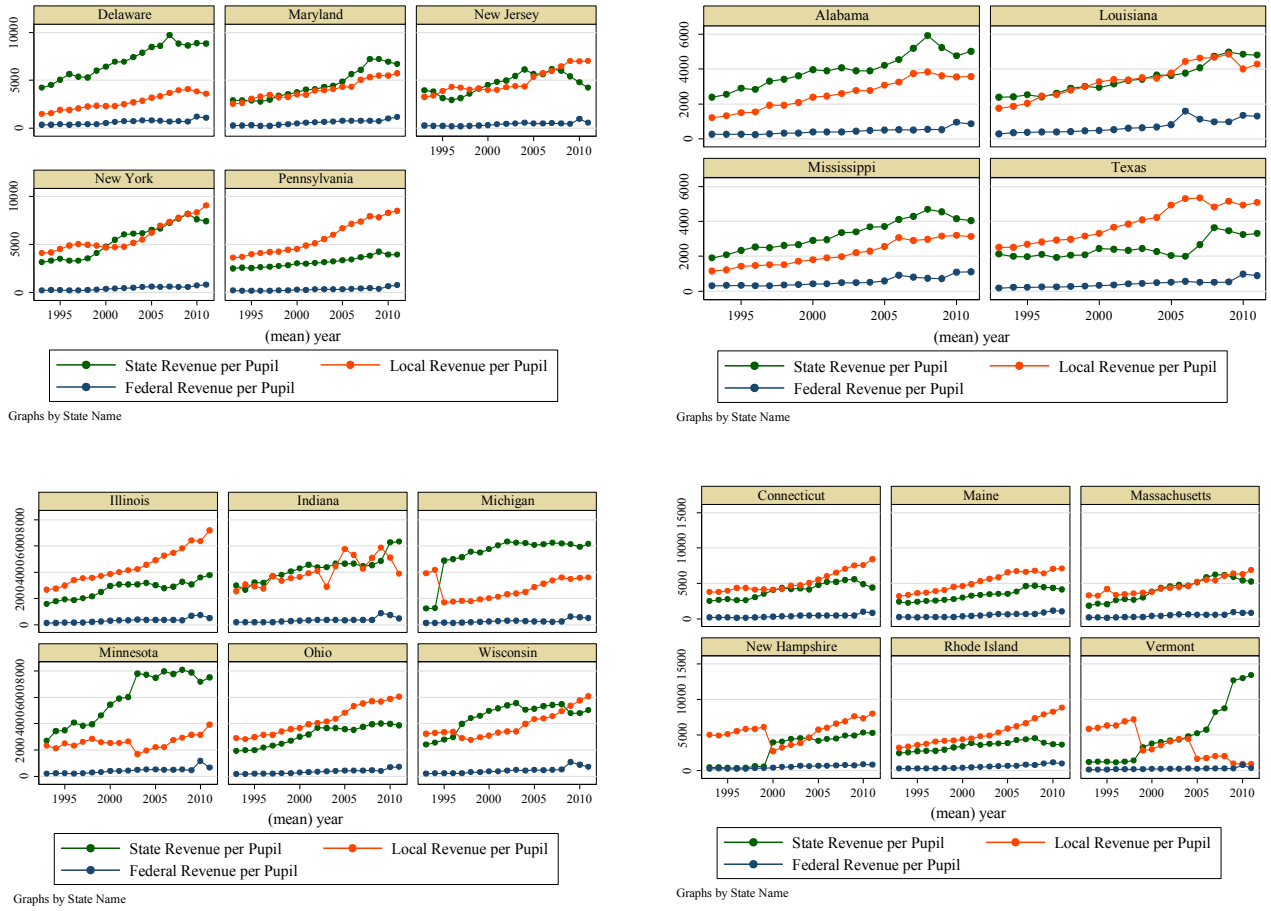

Figure 1. Time Trends in State Aid, Federal Aid and Local Revenue

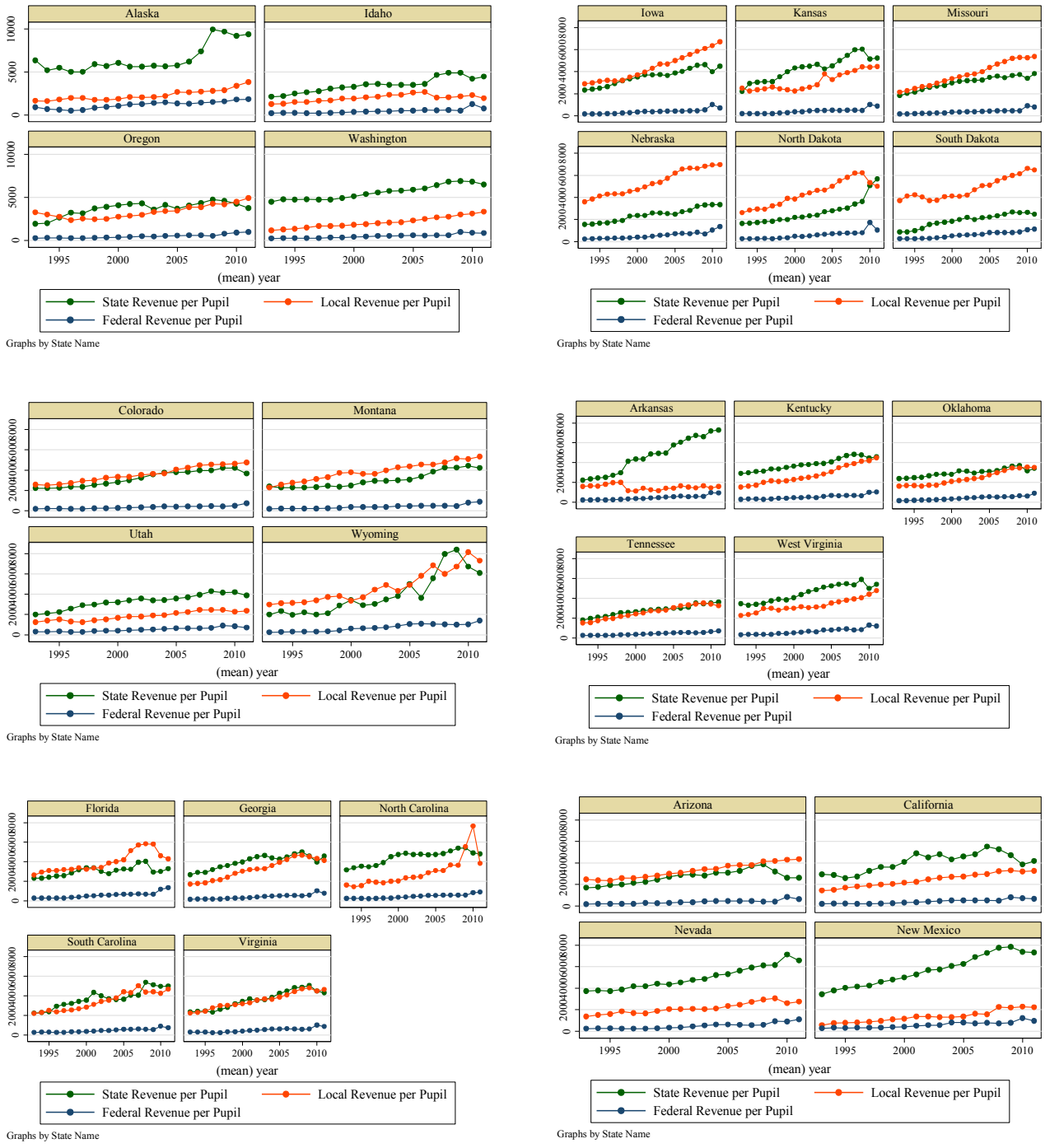

Figure 1 (cont.'d). Time Trends in State Aid, Federal Aid and Local Revenue

In many states, like New York and Kansas, one can visually observe that when state aid growth slows, local revenue increases. The two oscillate back and forth as counterbalancing forces. In some states, more abrupt shifts are apparent and in some cases those abrupt shifts are easily

explained by policy changes. In both New Hampshire and Vermont, local revenues were at specific points in time, reclassified as state revenues. Statewide property taxation requirements were adopted and some revenue from those statewide property taxes shared. The reclassification is revealed as an abrupt switch in New Hampshire and more than one switch in Vermont. Similarly, in Michigan in the 1990s, the state opted to aggressively replace local property tax effort with state aid raised through a mix of sin and sales taxes.

Table 1 summarizes the fixed effect estimates of local revenue response to changes in state aid, for all districts, high poverty districts and low poverty districts by state and time period. States are ranked from top to bottom in the table by strongest local revenue (counterbalancing) response to weakest for the complete time frame, all districts. States with dramatic, anomalous revenue reclassifications or policy induced substitutions top the list but do not reflect the more usual interplay between state and local revenues. States with subtler counterbalancing patterns of local revenue response including Wisconsin, Kansas, Texas and New York reveal more typical response patterns. Interestingly, in Kansas over time, low poverty districts have not generally responded to decreased state aid with increased local revenue, or increased state aid with decreased local revenue. This effect may be in part a result of the relatively small share of funding received by these districts from the state and may also be in part a function of strict revenue caps and larger shares of low poverty districts constrained by those caps. The response of higher poverty districts in Kansas is more expected, until the most recent downturn, where they too do not, or are unable to respond. One might then expect that if aid was substantively cut during this most recent downturn, inequities will have increased (or fairness decreased).

Overall, there appear to be many cases for high poverty districts during the 2007-11 economic downturn where local revenues responded in the same rather than opposite direction of state aid and in most cases that direction was downward. That local revenue growth either flattened out, or even declined while state revenue declined. During the period from 2007-2011, we saw the largest number of states where low poverty districts had local revenue changes moving in the opposite direction of state aid and the smallest number of states where high poverty districts showed the same inverse relationship. One implication of this finding is that the period from 2007-2011, dominated by cuts rather than increases to state aid, may also have led to unprecedented reductions in total resources to high poverty districts.

Table 1.
Within State Fixed Effects of Local Revenue on State Aid (Fixed Effect)

	All Years			2001-2005			2007-2011		
	All	Low Poverty	High Poverty	All	Low Poverty	High Poverty	All	Low Poverty	High Poverty
Count of Negative Coefficients	*25*	*25*	*30*	*25*	*21*	*27*	*28*	*31*	*21*
Vermont	-0.911	-0.821	-1.169	-1.705	-1.353	-2.307	-0.898	-0.892	-0.586
Arkansas	-0.585	-0.587	-0.61	-0.318	-0.419	-0.215	0.133	0.137	0.13
Minnesota	-0.489	-0.452	-0.66	-0.556	-1.039	-0.816	0.093	0.144	0.139
Michigan	-0.449	-0.473	-0.437	-0.064	-0.098	-0.103	-0.02	-0.025	-0.133
Idaho	-0.41	-0.138	-0.374	0.279	0.236	-0.646	0.259	-0.306	0.651
Oregon	-0.371	-0.223	-0.331	-0.085	-0.111	-0.083	-0.073	-0.166	0.298
Alaska	-0.203	-0.047	-0.178	-0.002	0.243	-0.053	-0.278	-0.241	0.063
Wisconsin	-0.201	-0.19	-0.179	-0.186	-0.202	-0.189	-0.174	-0.112	-0.211
Kansas	-0.183	0.091	-0.153	-0.173	0.271	-0.339	-0.027	-0.092	0.02
Indiana	-0.179	-0.044	-0.255	1.514	1.912	0.896	-0.36	-0.154	-0.485
South Dakota	-0.153	-0.135	-0.152	-0.018	-0.084	-0.183	-0.152	-0.005	0.015
Texas	-0.13	-0.109	-0.152	-0.336	-0.359	-0.334	-0.257	-0.159	-0.378
New Hampshire	-0.129	-0.14	-0.148	-0.304	0.154	-0.165	0.061	-0.243	0.116
Nebraska	-0.119	-0.065	-0.08	0.039	0.121	-0.065	0.004	-0.021	-0.023

Table 1. (cont.'d)
Within State Fixed Effects of Local Revenue on State Aid (Fixed Effect)

	All Years			2001-2005			2007-2011		
	All	Low Poverty	High Poverty	All	Low Poverty	High Poverty	All	Low Poverty	High Poverty
Count of Negative Coefficients	*25*	*25*	*30*	*25*	*21*	*27*	*28*	*31*	*21*
Colorado	-0.099	-0.064	-0.129	-0.006	-0.007	-0.018	-0.079	-0.056	0.076
New York	-0.088	-0.13	-0.097	0.145	0.103	0.157	0.026	-0.014	0.215
Massachusetts	-0.075	-0.064	-0.041	-0.127	-0.126	0.027	-0.265	-0.17	-0.285
Rhode Island	-0.062	0.033	-0.264	-0.039	0.19	-0.622	0.126	0.072	0.838
Pennsylvania	-0.045	0.011	-0.136	0.224	0.283	0.156	-0.177	-0.102	-0.277
New Jersey	-0.044	-0.033	-0.146	0.066	0.015	0.059	-0.006	-0.032	-0.035
Virginia	-0.043	-0.033	-0.159	-0.324	-0.384	-0.18	0.062	0.427	-0.001
Utah	-0.032	-0.002	-0.075	-1.347	-2.437	-0.014	-0.076	-0.007	-0.533
Arizona	-0.023	-0.007	-0.028	-0.026	0	-0.176	-0.119	-0.08	-0.148
Ohio	-0.022	-0.044	-0.04	0.004	-0.024	-0.005	0.013	0.007	0.051
Connecticut	-0.012	-0.074	0.05	0.021	0.022	0.031	-0.004	0.044	-0.023
West Virginia	0.001	-0.078	0.047	-0.266	-0.193	-0.35	0.211	-0.081	0.286
Nevada	0.005	0.319	0.062	-0.038	-0.109	0.034	-0.724	-0.091	0.198
Maryland	0.006	-0.045	-0.03	-0.01	-0.111	0.131	0.115	0.028	0.103
North Dakota	0.009	0.087	-0.034	0.013	0.201	0.024	-0.224	-0.298	-0.167
California	0.017	0.033	-0.012	-0.05	0.039	-0.155	0.051	0.038	0.14
Tennessee	0.022	0.047	0.037	-0.017	0.037	-0.078	-0.251	-0.216	-0.364
Oklahoma	0.025	0.009	0.098	-0.1	-0.182	-0.042	-0.119	-0.175	0.006
Montana	0.035	0.081	-0.033	0.175	0.035	0.178	0.018	-0.065	0.106
Wyoming	0.042	0.064	0.152	0.057	0.209	-0.123	-0.102	-0.049	-0.13
Illinois	0.047	0.015	0.009	0.047	0.04	0.05	0.138	0.105	0.145
South Carolina	0.078	-0.073	0.185	-0.22	-0.191	-0.407	-0.079	-0.444	0.209
Iowa	0.098	0.151	0.117	0.022	0.097	0.024	0.015	0.202	0.087
Maine	0.102	0.135	-0.013	0.031	0.011	0.066	-0.023	-0.102	-0.084
North Carolina	0.108	0.436	-0.15	0.347	-0.693	0.382	-0.018	-0.424	0.143
Washington	0.144	0.26	0.151	-0.154	0.048	-0.155	-0.074	0.1	-0.25
Florida	0.159	0.111	0.003	0.032	0.099	-0.01	0.229	0.278	0.081
Kentucky	0.175	0.327	0.095	0.223	0.336	0.163	-0.036	-0.126	0.018
Missouri	0.208	0.246	0.229	0.158	0.082	0.098	0.174	0.308	0.207
New Mexico	0.268	0.354	0.25	0.145	0	0.757	0.082	0.052	0.172
Mississippi	0.274	0.374	0.184	0.16	0.403	0.164	-0.048	0.271	-0.231
Delaware	0.292	0.178	0.398	0.115	0.181	0.25	-0.056	-0.281	-0.241
Alabama	0.412	0.415	0.432	0.396	0.451	0.592	0.065	0.19	-0.218
Louisiana	0.461	0.385	0.437	0.138	-0.151	0.163	0.137	0.354	0.375
Georgia	0.682	0.69	0.6	0.024	-0.173	0.036	0.101	0.233	0.019

Note: Figures are coefficients on the relationship between local revenue and state aid from fixed effects panel models.

State Level Spending Progressiveness Ratios

Figure 2 tracks the fairness ratios for the current spending and state and local revenue measures. The vertical axis in each graph measures the funding fairness ratio, where 1.0 indicates that a district with 30% children in poverty would have equal predicted funding to a district with 0% poverty. 1.5 means that a district with 30% poverty has 50% more predicted funding than a district with 0% poverty, thus a progressively funded system. So when the index is above the 1.0 horizontal line, the system is progressive and when the index is below the 1.0 horizontal line, the system is regressive.

As expected in most cases, the current spending fairness index is marginally more progressive than the state and local revenue fairness index and in most cases when one declines, the other declines and when one rises the other rises. However, there are some data irregularities which appear as shocks. Here, those occur potentially because of error in the measures, and also because

some states have particularly small sample sizes (numbers of districts) within year for generating estimates. States with few districts or many small districts tend to have more volatile fairness indices (Alaska, Delaware, Nevada, Utah, Vermont, Wyoming).

Among mid-Atlantic states, Pennsylvania and New York remain regressive throughout the period. New Jersey starts as a flat system in the 1990s, and climbs toward a significant progressive position through about 2006. After that, both spending and revenue fairness in New Jersey drop sharply back toward flat distribution (1.0). In the Deep South, Louisiana climbs slowly from regressive to progressive funding with substantive increases in funding over time allocated to New Orleans area schools in the post Katrina period. Notably, these increases started prior to Katrina. Texas revenue gradually fades toward regressiveness over time, and current spending, while progressive, fades slowly toward a flat state. Illinois remains regressive throughout the period, much like New York and Pennsylvania.

Perhaps the most consistent long run decline in funding fairness over time occurs in Missouri. The apparent progressive distribution in Missouri in the mid-1990s is largely a function of desegregation remedies imposed in Kansas City and St. Louis, which were financed primarily through forced local tax levy increases in those cities and an income tax surcharge on workers in Kansas City (see Green and Baker, 2006). After the U.S. Supreme Court issued its 1995 order in Missouri v. Jenkins (Kansas City case) asserting that the lower courts remedies had essentially gone too far, funding stagnated in the major urban centers.

Figure 2. Time Trends in Spending & Revenue Fairness

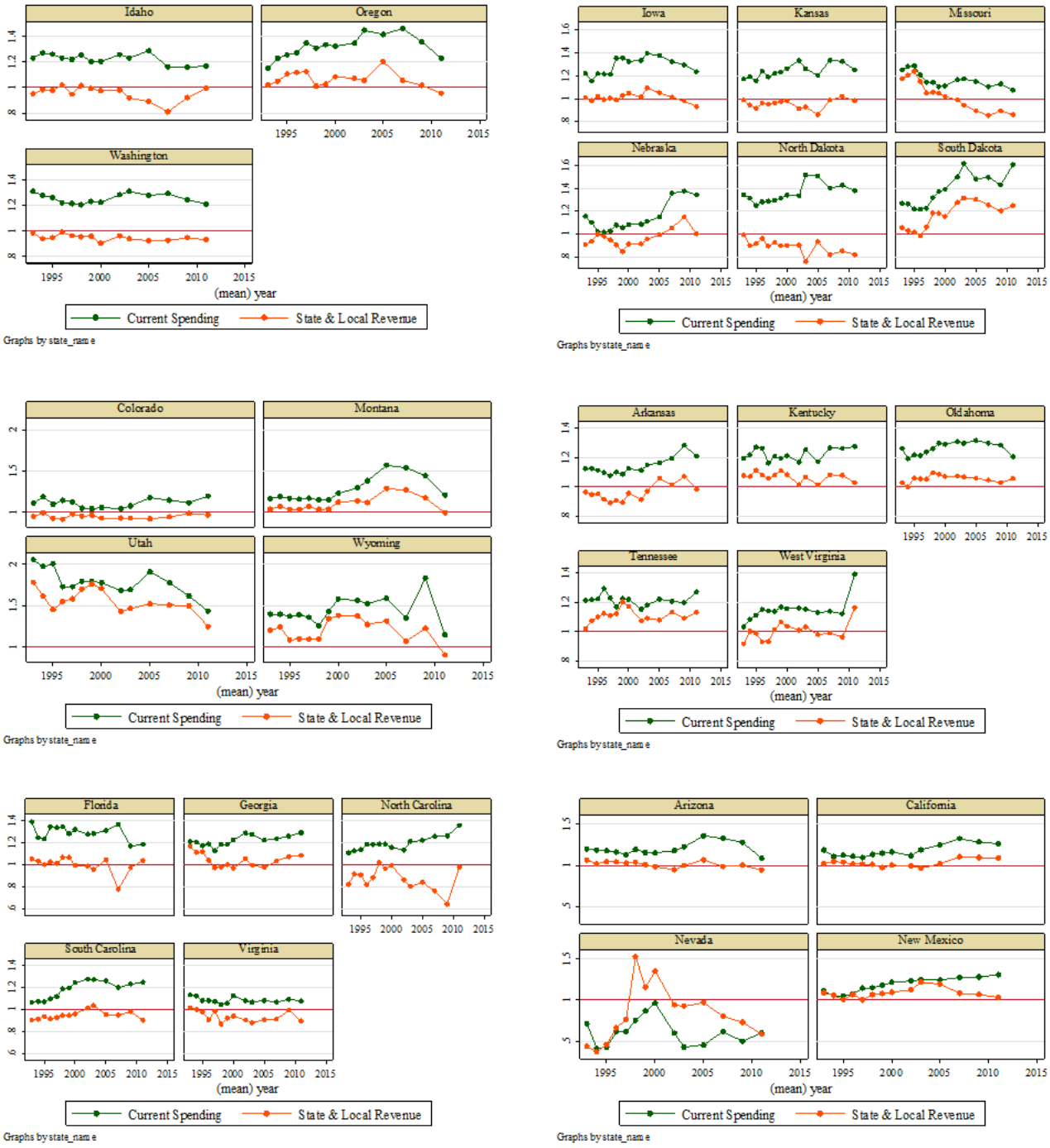

Figure 1 (cont.'d). Time Trends in Spending & Revenue Fairness

The Relative Influence of Revenue Sources on Spending Equity

Table 2 provides the results of a national panel model of state level data for the 19-year period and then for the previous two economic slowdown periods. Models reported in Table 2 evaluate the relationship between revenue source levels, revenue distributions with respect to poverty and current spending fairness. That is, to what extent do increased state, local or federal revenues contribute to spending fairness and to what extent do increased targeting of those revenues by poverty contribute to spending fairness. The expectation would be that increases in local revenue levels would contribute negatively to funding fairness, unless those increases to local revenue levels were coupled with increases in local revenue fairness (decreases in local revenue regressiveness). The expectation would also be that increases to state or federal revenue levels should lead to increases in spending fairness with the bulk of the contribution coming from state aid.

Of primary interest in Table 2 are the fixed effects estimates of the relationship between within state, over time changes in revenue levels and distribution and spending distribution. Across all years we do see that increases in state revenue are positively associated with increases in spending fairness (.033, $p<.05$). We don't however see that changes in state revenue fairness contribute positively to spending fairness. That is, level changes in state revenue, more so than distribution changes, are influencing changes in spending fairness.

We do see that changes to local revenue fairness contribute to spending fairness. That is, this direct relationship suggests either or both that as local revenues become more disparate, so too does spending, and as local revenues become less disparate so too does spending. Changes to federal revenue fairness (targeting) contribute positively to spending fairness and changes to federal revenue levels also contribute to spending fairness. That is, the effects of federal revenue are more consistent than those of state revenue at improving spending fairness, and the effects are of greater magnitude. The response in spending fairness for any $1 increase in federal aid is greater than the response to state aid, but the amount of federal revenue involved is much less.

During the early 2000s economic slowdown, the role of federal aid remains consistent, but state revenue increases are no longer positively associated with spending fairness increases. Some especially peculiar shifts occur for the most recent economic downturn. During this period, shifts in the fairness of local revenues are a relatively strong determinant of spending fairness. Again, this direct relationship may be operating in either direction. The more likely direction is that affluent districts outpaced significantly the local revenue of poorer districts as state aid declined, and these differences exacerbated wealth related inequities (reducing spending fairness).

There is also a direct relationship between state aid level and spending fairness. But, during this period state aid was most often cut quite dramatically, meaning that this coefficient likely represents the declining spending fairness that resulted from declining state aid. Perhaps most interesting is the finding that in the most recent downturn, changes in state aid fairness were negatively associated with changes in spending fairness. It may be the case that state aid fairness declined with state aid cuts. That is, cuts were levied in greater amounts for higher need, more aid dependent districts. It may be that as those cuts were levied, those higher need districts on average raised more local revenue to offset the cuts, buffering the equity declines. But other evidence herein suggests these efforts to buffer losses may not have worked so well.

Table 2.
Relationship of Revenue Components to Spending Fairness

	All Years			2001-2005			2007-2011		
	BE	FE	RE	BE	FE	RE	BE	FE	RE
Fairness Ratio State Revenue	-0.001	0.000	0.000	-0.001	-0.001	-0.001	-0.002	-0.004 *	-0.004 *
Fairness Ratio Local Revenue	0.189 *	0.073 *	0.076 *	0.164	-0.103	-0.043	0.068	0.202 *	0.164 *
Fairness Ratio Federal Revenue	0.043 *	0.022 *	0.022 *	0.045 *	0.015 *	0.016 *	0.034 *	0.034 *	0.034 *
State Rev PP (ln)	0.006	0.033 *	0.029 *	-0.152	-0.057	-0.090	-0.104	0.202 *	0.131 *
Local Rev PP (ln)	-0.029	0.006	-0.002	-0.094	0.000	-0.047	-0.059	0.133 *	0.060
Federal Rev PP (ln)	0.383 *	0.064 *	0.072 *	0.466 *	0.091 **	0.148 *	0.234 *	0.091 *	0.101 *
Constant	-1.308	0.321 *	0.373 *	-0.047	1.106	1.369 *	0.852	-2.488 *	-1.312 **
within	0.345	0.408	0.407	0.186	0.215	0.207	0.259	0.471	0.464
between	0.441	0.340	0.359	0.482	0.221	0.410	0.231	0.075	0.116
overall	0.319	0.310	0.321	0.405	0.211	0.355	0.234	0.129	0.173

N = 51 x 19 (1993 to 2011)
BE = Between Effects (between states), FE = Fixed Effects (within state over time), RE = Random Effects
*p<.05, **p<.10

Table 3 summarizes, by state, the correlations between the first differenced time series. These are simply bivariate correlations across 18 observations (changes between 19 periods) within each state. States are ranked from highest to lowest relationship between state aid level changes and spending fairness changes. Connecticut and New Jersey both display strong direct relationship between state aid increases and spending fairness increase, or vice versa. These states also display a strong positive relationship between state aid fairness and spending fairness, and the expected inverse relationship between local revenue level and spending fairness. The implication is that in these states, aid is significantly targeted toward at least some very high poverty districts.

In a number of states, changes in state revenue appear inversely associated with changes in spending fairness, suggesting a tendency either of state revenue increases to be targeted to less needy districts or state revenue decreases to be targeted to more needy districts. These findings make sense for some states like Missouri that during several years in this panel operated a matching aid formula whereby wealthier districts could receive more aid by choosing to raise more local revenue and they did. Similarly, states with relatively flat aid formulas, insensitive to either local fiscal capacity or student needs, like North Carolina appear to erode equity with aid increases (see Baker and Corcoran, 2012).

Table 3.
Contemporaneous Correlations with Change in Spending Fairness (first differenced)

State	Change in State Revenue Level	Change in Local Revenue Level	Change in State Revenue Fairness	Change in Local Revenue Fairness
Connecticut	0.744	-0.613	0.683	-0.554
New Jersey	0.630	-0.283	0.371	-0.299
Florida	0.600	-0.086	-0.128	0.254
Iowa	0.578	-0.002	0.771	-0.317
Maryland	0.521	-0.096	0.549	-0.395
New York	0.459	-0.241	0.177	0.270
Wyoming	0.438	-0.524	-0.020	-0.332
Ohio	0.43	-0.150	0.196	-0.064
Rhode Island	0.401	-0.135	0.433	-0.16
Washington	0.401	-0.418	-0.170	0.249
California	0.400	-0.022	0.095	-0.369
Arizona	0.360	0.249	0.401	-0.484
Massachusetts	0.348	0.141	0.600	0.214
Wisconsin	0.329	-0.313	0.638	-0.497
Kansas	0.329	-0.030	0.321	-0.197
Alaska	0.292	-0.735	0.728	-0.323
Maine	0.241	0.271	0.218	0.287
New Hampshire	0.238	-0.199	-0.208	0.523
Nebraska	0.231	-0.321	0.090	0.218
Georgia	0.201	0.007	0.063	0.133
Louisiana	0.198	-0.259	0.173	0.389
Vermont	0.176	-0.341	0.265	0.278
Texas	0.175	0.133	0.312	-0.397
Nevada	0.174	0.089	0.361	-0.172
Minnesota	0.158	-0.020	0.634	-0.120
Mississippi	0.155	-0.223	-0.133	-0.067
Michigan	0.149	-0.182	-0.059	0.079
Virginia	0.138	-0.444	0.042	0.276
Delaware	0.129	0.281	-0.18	0.183
Oregon	0.124	-0.089	-0.042	-0.037
Utah	0.075	0.520	0.033	0.360

Table 3. (cont.'d)
Contemporaneous Correlations with Change in Spending Fairness (first differenced)

State	Change in State Revenue Level	Change in Local Revenue Level	Change in State Revenue Fairness	Change in Local Revenue Fairness
North Dakota	0.032	-0.048	0.210	-0.289
West Virginia	0.005	0.215	0.429	-0.158
South Carolina	-0.016	-0.41	0.277	0.299
New Mexico	-0.033	-0.116	-0.157	0.053
Pennsylvania	-0.070	0.093	-0.261	0.547
Tennessee	-0.093	-0.283	0.183	0.478
Kentucky	-0.101	-0.09	0.564	0.051
Montana	-0.168	0.197	0.645	0.166
Idaho	-0.172	0.090	0.613	0.481
Arkansas	-0.192	-0.031	0.191	0.244
Missouri	-0.195	-0.009	0.201	0.668
Oklahoma	-0.205	0.256	-0.109	0.269
Indiana	-0.206	-0.021	0.648	-0.073
Colorado	-0.214	0.021	0.102	0.198
South Dakota	-0.232	0.105	0.279	-0.368
Illinois	-0.255	0.133	0.478	0.378
North Carolina	-0.437	0.125	0.031	-0.043
Alabama	-0.452	-0.377	0.214	0.063

Figure 3 shows the relationships between year-over-year state aid changes and spending fairness changes over time, within select states. The point of figure 4 is to illustrate specifically what has happened in the most recent three years (08-09, 09-10, 10-11), as state aid declined and spending fairness fell with it. The most recent three years of data are shown in orange. In New Jersey, in the late 1990s and early 2000s, state aid increases were common. And with those state aid increases came increases to the fairness index of current spending. Those increases all fall in the upper right quadrant of the figure. But, in the most recent three years, decreases in state aid led to declining spending progressiveness. New York shows a similar picture for 2009-10 and 2010-11, but had some increase the prior year. In both of the two most recent periods as aid declined so too did the fairness ratio. In Kansas the biggest reductions of aid and decline in fairness occur in 2009-10, with those reductions then held constant in 2010-11. Notably, in Kansas and Texas there is a less clear relationship between aid increases and funding fairness than in New York or New Jersey.

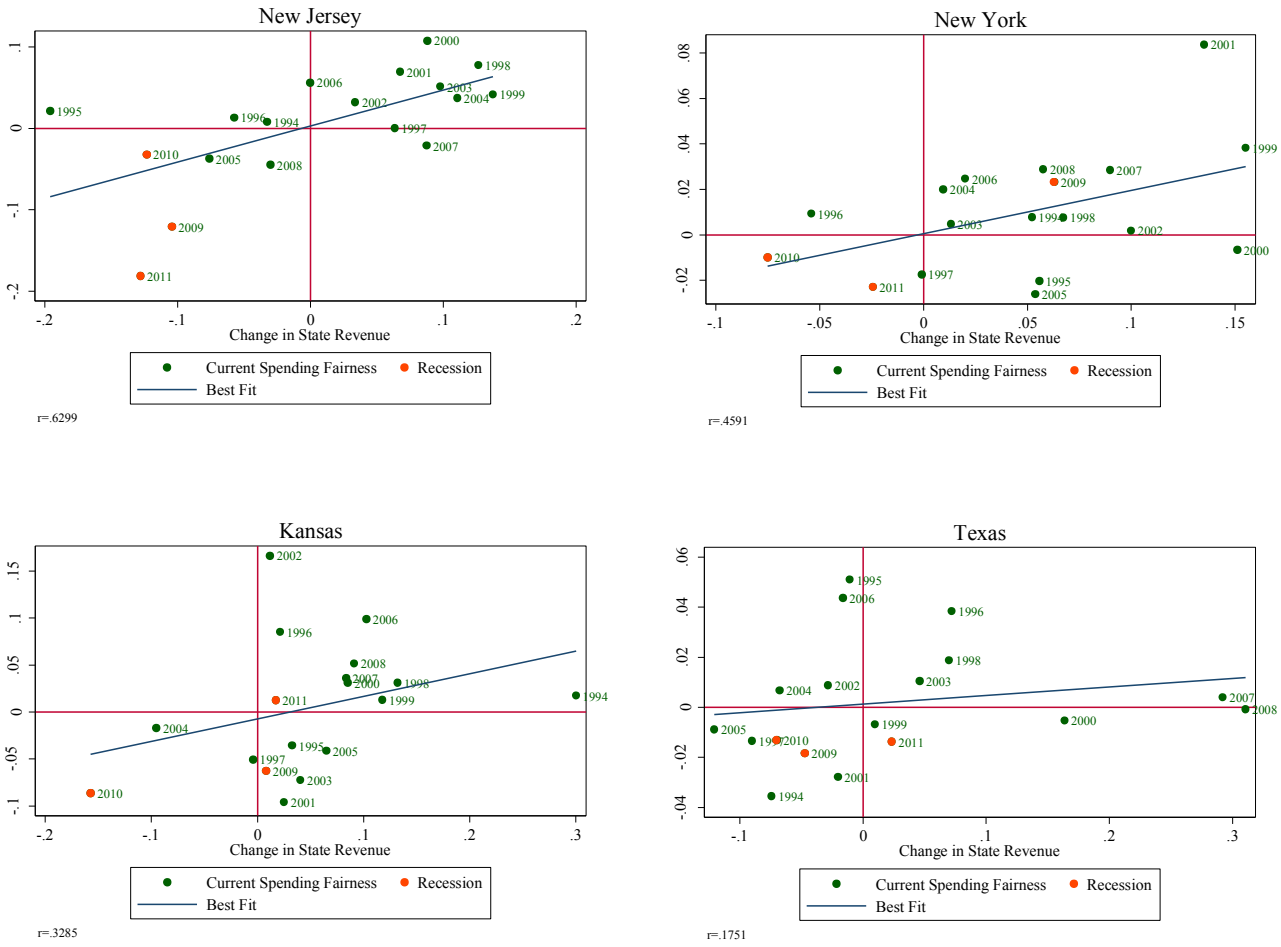

Figure 3. State Funding Level and Spending Fairness (Examples)

Finally, Table 4 summarizes the most recent three years of changes in current spending and state and local revenue fairness ratios by state, with states having the biggest declines in fairness ratios listed from top to bottom. 36 states had a three year average reduction in current spending fairness between 2008-09 and 2010-11 and 32 states had a three year average reduction in state and local revenue fairness over that same time period. At the top of the list are some states with particularly unstable estimates, because they are small in total population and/or have very few school districts. These include Wyoming, Utah, Nevada and Alaska. Colorado's reduction in progressiveness results primarily from a one year data reporting issue, with substantially greater spending and revenue reported for Denver public schools in 2008. Colorado's decline in spending fairness occurs entirely from 2008 to 2009.

Setting these states aside, New Jersey tops the list in reduced fairness in funding, with three years in a row of declining fairness ratios for current spending. Arizona, Delaware and Massachusetts also have three years in a row of declining spending fairness but with smaller magnitude changes. While some states show positive changes to fairness, these are nearly all very small, meaning that spending in these states remained relatively flat.

Table 4.
Year over Year Changes in Fairness Index from 2008-09 to 2010-11

	Current Spending				State & Local Revenue			
	2008-09	2009-10	2010-11	3yr Mean	2008-09	2009-10	2010-11	3yr Mean
Decline Count	32	30	28	36	32	34	32	32
Average	-0.05	-0.04	-0.01	-0.03	-0.03	-0.05	-0.01	-0.03
Wyoming	0.13	-0.57	-0.12	-0.19	-0.20	-0.21	-0.11	-0.17
Utah	-0.35	-0.19	0.01	-0.18	-0.07	-0.28	0.03	-0.11
Nevada	-0.61	0.13	-0.03	-0.17	-0.32	-0.09	-0.06	-0.15
Alaska	0.17	-0.65	-0.01	-0.16	-0.16	-0.87	-0.19	-0.41
Colorado	-0.54	0.05	0.03	-0.15 *	-0.01	0.01	-0.03	-0.01
New Jersey	-0.12	-0.03	-0.18	-0.11	0.06	-0.29	-0.09	-0.11
Florida	-0.32	0.07	-0.05	-0.10	0.00	0.11	-0.05	0.02
Montana	-0.01	-0.25	0.02	-0.08	-0.09	-0.17	-0.01	-0.09
Arizona	-0.02	-0.15	-0.04	-0.07	0.08	0.00	-0.06	0.01
Delaware	-0.12	-0.02	-0.06	-0.07	-0.07	-0.23	-0.01	-0.10
Massachusetts	-0.08	-0.03	-0.08	-0.06	-0.16	0.02	-0.08	-0.07
Minnesota	-0.27	0.05	0.04	-0.06	-0.05	0.03	-0.07	-0.03
Oregon	-0.03	-0.10	-0.03	-0.05	-0.01	-0.02	-0.04	-0.03
Vermont	0.04	-0.12	-0.08	-0.05	-0.07	-0.20	-0.02	-0.09
Idaho	-0.15	-0.03	0.05	-0.05	-0.07	-0.13	0.21	0.00
Kansas	-0.06	-0.09	0.01	-0.05	-0.02	-0.01	-0.02	-0.02
Nebraska	-0.08	-0.03	0.00	-0.04	0.01	-0.17	0.02	-0.05
Iowa	-0.05	-0.11	0.05	-0.04	-0.01	-0.09	0.04	-0.02
Maine	-0.09	0.00	-0.02	-0.03	0.01	0.09	-0.06	0.01
Washington	-0.07	-0.03	-0.01	-0.03	-0.04	-0.03	0.01	-0.02
Maryland	-0.08	-0.02	0.01	-0.03	-0.02	-0.10	0.00	-0.04
Arkansas	-0.01	-0.05	-0.02	-0.03	-0.01	-0.05	-0.03	-0.03
Oklahoma	0.00	0.00	-0.08	-0.03	0.00	-0.02	0.05	0.01
Missouri	-0.01	0.00	-0.05	-0.02	0.01	-0.03	0.00	-0.01
Connecticut	-0.02	-0.01	-0.04	-0.02	-0.02	-0.10	-0.08	-0.07
Indiana	0.02	-0.06	-0.02	-0.02	-0.05	0.02	-0.02	-0.01
California	-0.03	-0.04	0.02	-0.02	-0.04	-0.05	0.04	-0.01
New Hampshire	0.36	-0.05	-0.36	-0.02	0.22	0.04	-0.23	0.01
Texas	-0.02	-0.01	-0.01	-0.02	-0.01	0.01	-0.02	-0.01
North Dakota	0.01	0.01	-0.06	-0.01	0.00	-0.01	-0.03	-0.01
Ohio	0.01	-0.05	0.00	-0.01	-0.06	-0.05	0.00	-0.04
Wisconsin	-0.05	0.00	0.02	-0.01	-0.03	0.05	0.01	0.01
Rhode Island	0.02	0.00	-0.04	-0.01	0.00	-0.04	0.00	-0.01
Kentucky	-0.04	0.06	-0.04	-0.01	-0.02	-0.01	-0.04	-0.02
New Mexico	-0.04	-0.01	0.04	0.00	0.05	-0.02	-0.02	0.01
New York	0.02	-0.01	-0.02	0.00	0.03	-0.03	0.01	0.00
Illinois	0.01	-0.02	0.02	0.00	-0.06	-0.01	0.13	0.02
Virginia	0.03	0.05	-0.06	0.01	0.05	-0.03	-0.07	-0.01
South Carolina	0.00	0.01	0.01	0.01	0.01	-0.01	-0.07	-0.02
Tennessee	-0.05	0.03	0.04	0.01	-0.08	0.03	0.01	-0.01
Louisiana	0.02	0.02	-0.02	0.01	0.01	0.11	-0.09	0.01
Michigan	-0.01	0.01	0.03	0.01	0.03	-0.01	0.01	0.01
Georgia	0.01	0.00	0.03	0.01	0.00	0.01	0.00	0.00
Mississippi	0.00	0.00	0.05	0.02	0.01	-0.01	0.02	0.01
Pennsylvania	0.06	0.00	0.01	0.02	0.04	-0.05	-0.01	-0.01
North Carolina	-0.02	0.09	0.00	0.02	-0.28	-0.07	0.40	0.02
Alabama	0.01	0.05	0.01	0.02	0.05	0.02	-0.01	0.02
South Dakota	-0.06	0.11	0.07	0.04	-0.05	0.06	-0.02	0.00
West Virginia	-0.06	0.01	0.26	0.07	-0.12	0.14	0.06	0.03

*Anomalous bump in spending for Denver Public Schools occurs in 2008.

It is important not to forget that these changes occur against different baseline conditions, including different overall levels of spending and different degrees of progressiveness. New Jersey and Massachusetts experience reduced funding fairness, but both were previously among the most

progressively funded states. New Jersey falls behind Massachusetts by the end of the period, because its declines are more substantial. Utah also experiences a decline in fairness and had relatively high fairness ratio at the outset, but very low average overall spending. By contrast, New York, Illinois and Pennsylvania appear to remain relatively unchanged in terms of fairness during the recession. But, for these three states this merely means that they have retained their already regressive state school finance systems. They may not have gotten much worse, but they also didn't get better.

Conclusions & Policy Implications

The recent recession yielded an unprecedented decline in public school funding fairness. Thirty-six states had a three year average reduction in current spending fairness between 2008-09 and 2010-11 and 32 states had a three year average reduction in state and local revenue fairness over that same time period. Over the entire 19-year period, only 15 states saw an overall decline in spending fairness. In years prior to 2008 (starting in 1993) only 11 states saw an overall decline in spending fairness.

Declining funding fairness during the downturn resulted in part from cuts to state aid but also from a shifting role for federal aid. Further, during the period from 2007-2011, local public school districts' ability to offset losses to state aid varied. During the period from 2007-2011 compared to earlier periods, we saw the largest number of states where low poverty districts had local revenue changes moving in the opposite direction of state aid and the smallest number of states where high poverty districts showed the same inverse relationship. That is, during the downturn, low poverty districts compensated strongly for cuts to state aid while high poverty districts were unable to do the same.

In general, over the long haul, increases to state aid levels help to improve spending fairness. We see less clear evidence of shifts in state aid fairness resulting in shifts to spending fairness. We do, however, see that changes to local revenue fairness contribute to spending fairness. That is, this direct relationship suggests either or both that as local revenues become more disparate, so too does spending, and as local revenues become less disparate so too does spending. Despite a generally positive role for state aid improving spending equity, the role of state aid is not uniformly positive. In a number of states (16), changes in state revenue appear inversely associated with changes in spending fairness, suggesting a tendency either of state revenue increases to be targeted to less needy districts or state revenue decreases to be targeted to more needy districts.

Federal aid also seems to contribute to spending fairness. Changes to federal revenue fairness (targeting) contribute positively to spending fairness and changes to federal revenue levels also contribute to spending fairness. But, while the change in spending fairness resulting from a $1 increases in federal aid may be stronger in magnitude than the response to state aid, the overall level of federal aid is much smaller and therefore its overall effect on equity more modest.

While estimates herein shed some light on nationally representative patterns, above all else the findings herein highlight the heterogeneity of school finance across states. Yes, the recent downturn led to significant declines in funding fairness across a majority of states. Yes, state aid, on average, helps improve fairness. Yes, fairness of spending is compromised by disparity in access to local revenues. But, these relationships vary widely across states and defy simple classifications. In several states, abrupt policy decisions led to reclassification (Vermont and New Hampshire) or substitution (Michigan) of state and local revenue sources distorting the interplay between state and local revenues. Yet none of these cases led to sustained, substantive improvements to spending equity.

While equity overall took a hit between 1997 and 2011, the initial state of funding equity varied widely at the outset of the period, with Massachusetts and New Jersey being among the most progressively funded states in 2007. Thus, they arguably had further to fall. Funding equity for many states has barely budged over time, and remained persistently regressive, for example in Illinois, New York and Pennsylvania. Potential influences on these patterns are also evasive and widely varied. In Missouri, we see the 1990s influence of desegregation orders, which capitalized on the state's matching aid program to generate additional revenue in Kansas City and St. Louis driving spending progressiveness, but when the state adopts a need weighted foundation aid formula in 2006, spending continues to become more regressive. We see the more logical influence of school finance reforms in Massachusetts in the early 1990s and in New Jersey in the late 1990s, following court order, targeting additional funds to needy districts yielding an overall pattern of progressiveness. Court order in New York State (2006) appears to have had little or no influence on equity and the influence of court orders over time in Kansas has moved the needle only slightly. Better understanding role of judicial involvement requires significant additional exploration of these data linked to information on both judicial activity and legislative reforms.

Increased availability of long run, annual longitudinal data for tracking ebbs and flows of state school finance systems creates new opportunities to explore both the causes and consequences of those shifts over time. The present article merely scratches the surface by describing those shifts and providing preliminary evaluation of their causes. Of particular interest are the long term consequences, including the extent to which the recent downturn alters the distribution of programs and services to children, or the distribution of teachers by observable attributes.

The coming years will tell us both whether state school finance systems can rebound from the effects of the downturn or whether these effects have become permanent, and will inform us about the consequences for short and long term student outcomes. A significant body of literature has now shown the positive effects of equity and adequacy improvements of the prior 40+ years of school finance reform. Similar methods applied years from now may reveal the deleterious influences of these dark ages of American public school finance.

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Appendix A

Table A1.
Data Elements and Sources

Data Element	Variable Name (construction)	Unit of Analysis	Data Source	Years Available	Years Imputed* (method)
Per Pupil Spending	PPCSTOT	District	F-33	1993-2011	
State Revenue	STREV	District	F-33	1993-2011	
Local Revenue	LREV	District	F-33	1993-2011	
Federal Revenue	FEDREV	District	F-33	1993-2011	
Enrollment		District	CCD	1993-2011	
Grade Ranges	K12 or not	District	CCD	1993-2011	
Pupil/Teacher Ratios	PUPTCH	District	CCD	1993-2011	
Education Comparable Wage Index		District	Texas A&M (Taylor)	1997-2011	1993-1996 (state x year extrapolation/ Interpolation)
Child Poverty		District	Census Small Area Income and Poverty Estimates	1995, 1997, 1999, 2000-2011	1993-1994, 1996, 1998 (state x year extrapolation/ Interpolation)

Appendix B

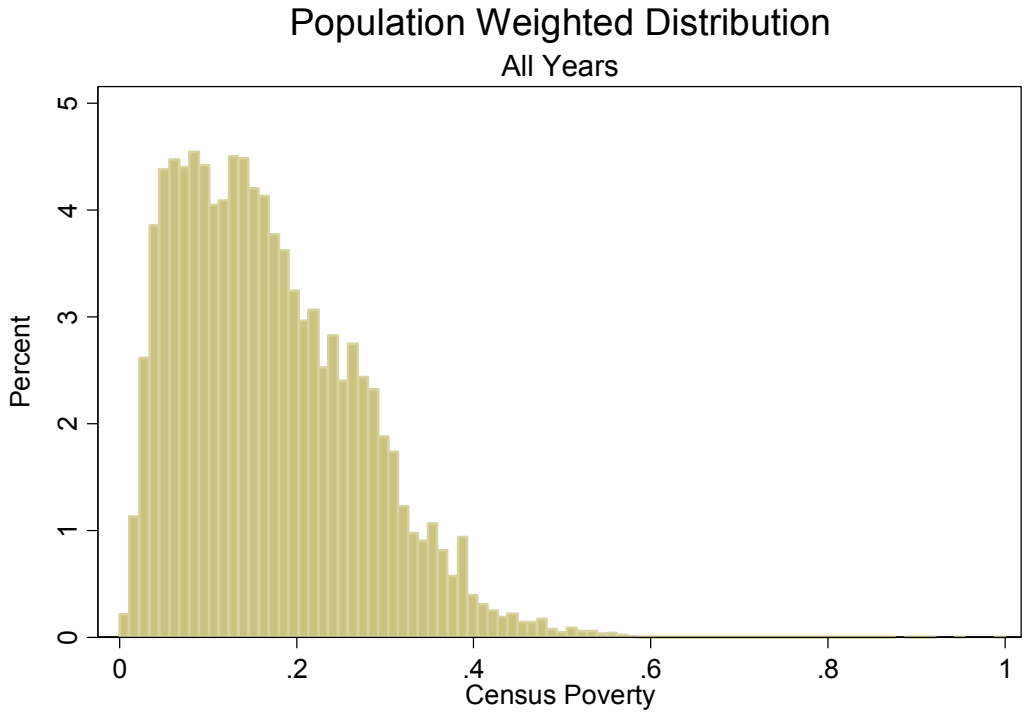

Figure B1. Distribution of District Poverty Rates

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