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Revisiting the Age-Old Question: Does Money Matter in Education?

Bruce D. Baker, Rutgers University

Executive Summary

This policy brief revisits the long and storied literature on whether money matters in providing a quality education. Increasingly, political rhetoric adheres to the unfounded certainty that money doesn't make a difference in education, and that reduced funding is unlikely to harm educational quality. Such proclamations have even been used to justify large cuts to education budgets over the past few years. These positions, however, have little basis in the empirical research on the relationship between funding and school quality.

In the following brief, I discuss selected major studies on three specific topics; a) whether money in the aggregate matters; b) whether specific schooling resources that cost money matter; and c) whether substantive and sustained state school finance reforms matter. Regarding these three questions, I conclude:

Does money matter? Yes. On average, aggregate measures of per-pupil spending are positively associated with improved or higher student outcomes. In some studies, the size of this effect is larger than in others and, in some cases, additional funding appears to matter more for some students than others. Clearly, there are other factors that may moderate the influence of funding on student outcomes, such as how that money is spent – in other words, money must be spent wisely to yield benefits. But, on balance, in direct tests of the relationship between financial resources and student outcomes, money matters.

Do schooling resources that cost money matter? Yes. Schooling resources which cost money, including class size reduction or higher teacher salaries, are positively associated with student outcomes. Again, in some cases, those effects are larger than others and there is also variation by student population and other contextual variables. On the whole, however, the things that cost money benefit students,

and there is scarce evidence that there are more cost-effective alternatives.

Do state school finance reforms matter? Yes. Sustained improvements to the level and distribution of funding across local public school districts can lead to improvements in the level and distribution of student outcomes. While money *alone* may not be the answer, more equitable and adequate allocation of financial inputs to schooling provide a necessary underlying condition for improving the equity and adequacy of outcomes. The available evidence suggests that appropriate combinations of more adequate funding with more accountability for its use may be most promising.

While there may in fact be better and more efficient ways to leverage the education dollar toward improved student outcomes, we do know the following:

- Many of the ways in which schools currently spend money do improve student outcomes.

- When schools have more money, they have greater opportunity to spend productively. When they don't, they can't.

- Arguments that across-the-board budget cuts will not hurt outcomes are completely unfounded.

In short, money matters, resources that cost money matter, and more equitable distribution of school funding can improve outcomes. Policymakers would be well-advised to rely on high-quality research to guide the critical choices they make regarding school finance.

Revisiting the Age-Old Question: Does Money Matter in Education?

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Framing the Question

It is hard to imagine a time in the history of American public education when there has been such a widespread political effort to argue that improving the quality of schools has little or nothing to do with the amount of money spent on public education. That is, that money simply doesn't matter.

Political certainty regarding the unimportance of money for schools and the need for schools to "tighten their belts" is frequently grounded in misrepresentations of total spending growth and test score trends at the national level over the past 30 years. The typical storyline is that spending per pupil has increased dramatically and pupil-to-teacher ratios have declined,[1] at the same time that scores on national assessments have stagnated, and scores on international assessments have fallen behind the rest of the developed world.[2] The conclusion: we're spending more and more, and not getting results, so it's clear that money doesn't make a difference.

To a large extent, the escalation of rhetoric is a sign of the times, in terms of both economic and political context. U.S. Secretary of Education Arne Duncan has declared this to be the era of the "new normal," a period in which budget cutbacks are the norm and local public school districts must learn to do more with less.

At the state level, where the primary responsibility for financing public schools lies, this rhetoric has been particularly bold.

Florida Governor Rick Scott, in justifying his recent 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."[3]

In his 2011 "State of the State" address, New York Governor Andrew Cuomo declared:

> "Not only to we spend too much, but we get too little in return. We spend more money on education than any state in the nation and we are number 34 in terms of results." [4]

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."[5]

While political rhetoric is often divorced from empirically rigorous research, the echo chamber regarding the unimportance of funding for improving school quality has amplified, and has migrated to the entirely unsupportable proposition that funding cuts cause no harm. In other words, the political message has gone several steps beyond questioning whether or not a systematic relationship exists between funding and school quality – a classic research framing of the issue – to bold assertions that we now know, with certainty, that money doesn't matter and that the path to school improvement can be accomplished despite – or even because of - reductions in spending.

Political certainty regarding the unimportance of money for schools and the need for schools to "tighten their belts" is frequently grounded in misrepresentations of total spending growth and test score trends at the national level over the past 30 years.

The growing political consensus stands in sharp contrast to the substantial body of empirical research that has accumulated over time, but which gets virtually no attention in our public discourse.[6] This policy brief reviews that literature. Specifically, I review three major bodies of evidence, each of which pertains to a specific element of the broad topic of whether money matters in determining the quality of education. These three literatures are organized by the following guiding questions:

1. **Does money matter?** Are differences in aggregate school funding associated with differences in short- and long term measured outcomes?
2. **Do school resources that cost money matter?** Where "resources" mean the various things that money buys, such as smaller classes, higher salaries, or instructional materials. Are differences in access to specific schooling programs or resources, including teacher attributes, associated with differences in short- and long-term measured outcomes?
3. **Do school finance reforms matter?** Do substantive and sustained reforms to state school finance systems, including raising the level of funding or redistributing money more equitably, lead to improvements in the level or distribution of student outcomes?

I discuss only domestic studies, primarily those which focus on short-term and intermediate-term outcomes, such as achievement (e.g., test scores) and attainment (e.g., graduation). Furthermore, preference is given to studies which appear in peer reviewed academic journals and books (see end note for full selection criteria).[7] I also discuss the sources of information that have been frequently used to cast doubt on whether money is related to

educational outcomes. Finally, I summarize what we know from the preponderance of evidence, as derived from rigorous empirical analysis, as well as what we do not yet know. In an appendix to this brief, I discuss, in general terms, methodological issues around the study of whether money matters in education.

From The Coleman Report to the Production Function

The saga over whether money matters in American public education can be traced back to the broader question of whether *schools* matter. That is, whether schools and school quality have any influence on student achievement, educational attainment, and future earnings. The first national, large-scale quantitative analysis to explore this question was the widely cited James Coleman report on "Equality of Educational Opportunity," which came about as part of the Civil Rights Act of 1964.[8]

Among other things, the Coleman report explored the relationship between school resource measures and student outcomes, finding little relationship between the two. Using the (more limited) statistical techniques of the day, Coleman concluded that, on balance, the strongest correlations with student outcome measures were not found in schools, but rather among factors related to parental income and education levels and resources in the home. That said, among school resource measures, Coleman did find that teacher characteristics were positively associated with student outcomes, and more strongly so for minority students compared with white students.[9] Nonetheless, the implication drawn by many was that schools simply don't matter. An extension of this implication was that putting more money into schools to try to improve quality was unlikely to matter either.

However, recent re-analyses of the Coleman report data, using up-to-date statistical techniques and computing capacity, found that even Coleman's data indicate that schooling quality has significant effects on student outcomes. In one recent example, Konstantopolous and Borman (2011) conclude:

> "Our results also indicated that schools play meaningful roles in distributing equality or inequality of educational outcomes to females, minorities, and the disadvantaged."[10]

In a related analysis, Borman and Dowling (2010) report:

> "Even after statistically taking into account students' family background, a large proportion of the variation among true school means is related to differences explained by school characteristics.[11]

In short, while family background certainly matters most, schools matter as well. Furthermore, there exist substantive differences in school quality that explain a substantial portion of the variation in student outcomes.

Subsequent studies using alternative data sources to explored the relationship between schooling quality and various outcomes, including the economic rate of return to schooling – e.g., future earnings. For example, David Card and Alan Krueger (1992) studied the relationship between school quality measures, including pupil to teacher ratios and relative teacher pay, on the rate of return to education for men born between 1920 and 1949. Card and Krueger found that men educated in states with higher-quality schools have a higher return to additional years of schooling. Rates of return were also higher for individuals from states with better-educated teachers. [12]

Similarly, Julian Betts (1996) provided an extensive review of the literature that attempts to link measures of schooling quality and adult earnings, including Card and Krueger's study. Betts explains that, while the overall results of such studies were mixed, they were generally positive. More specifically, he pointed to more positive results for studies evaluating the association between district-level spending and earnings, as opposed to those attempting to identify a link between *school*-level resources and earnings, for which results are murkier.[13]

The re-analyses of Coleman's data, coupled with subsequent credible findings using alternative data sources, served to discredit the original Coleman report findings (or more specifically, common interpretations of Coleman that schools and school quality matter little). It is now clear that schools matter.

Is Aggregate Spending Correlated with Outcome Measures?

After the release of the Coleman report, numerous scholars took advantage of new and richer data sources. They were largely focused on exploring in greater depth whether and why schools don't seem to matter – the common, and now discredited, interpretation of the Coleman report. Twenty years after Coleman, Eric Hanushek (1986) published the paper that would arguably become the most widely cited source for the claim that money simply doesn't matter when it comes to improving school quality and student outcomes.[14]

The paper, a meta-analysis of the large collection of post-Coleman studies, used data from a variety of contexts, small and large, in the United States and elsewhere. Hanushek tallied the findings of those studies. Some found a positive relationship between spending and student outcomes, while others found no relationship or a negative one. He came to the following conclusion, which was italicized for emphasis in the original publication:

> ***"There appears to be no strong or systematic relationship between school expenditures and student performance." (p. 1162)***[15]

For years to follow (and to this day), this finding has become a mantra for many politicians and advocates. It has echoed through the halls of state (and federal) courthouses where school funding is deliberated. It has maintained an impressive air of credibility in many circles, although, as discussed below, the analyses behind it were refuted on numerous occasions by

leading scholars in the decade that followed. Furthermore, as also shown below, many of the studies originally reviewed by Hanushek, which were published in the 1960s and 1970s, no longer pass muster methodologically, given advances in data quality, statistical techniques, and researchers' understanding of educational production and schooling quality.

In assessing Hanushek's conclusion, it is important to distinguish between *inconsistent* findings about the spending/outcomes relationship on the one hand, and bold declarations that money doesn't matter on the other. Within a developed body of research on almost any topic, there is always at least some degree of inconsistency in findings. The key is to adjudicate between studies in terms of their quality and scope, and to assess whether a general conclusion might be drawn from the preponderance of the high-quality evidence.

Accordingly, the most direct rebuttal to Hanushek's characterization of the findings of existing research came in a series of re-analyses by University of Chicago scholars Larry Hedges, Rob Greenwald, and Richard Laine. Hedges and colleagues gathered the studies originally cited by Hanushek in 1986 and conducted meta-analyses of those that met certain quality parameters. They included studies that: a) had appeared in a refereed journal or book; b) used U.S. data; c) had outcome measures that were some form of academic achievement; d) used data at the district- or less aggregate level; e) employed a model that controlled for socioeconomic characteristics, fit with longitudinal data; f) and included data that were independent of other data included in the universe. Notably, these "quality control measures" pruned a significant share of studies[16] used by Hanushek.

Specifically pertaining to aggregate per-pupil spending measures, Greenwald, Hedges, and Laine (1996) found that, among statistically significant findings, the vast majority of study findings were positive (11:1) and that, most of the analyses that did not find a statistically discernible relationship between spending and outcomes still found a positive association (p. 368). They concluded:

> "Global resource variables such as PPE [per-pupil expenditures] show strong and consistent relations with achievement. In addition, resource variables that attempt to describe the quality of teachers (teacher ability, teacher education, and teacher experience) show very strong relations with student achievement." (p.384)

Digging deeper, and exploring the relationship between a variety resource and student outcome measures, Greenwald, Hedges, and Laine came to the conclusion that "a broad range of resources were positively related to student outcomes, with 'effect sizes' large enough to suggest that moderate increases in spending may be associated with significant increases in achievement." (p. 361) [17] This finding stands in sharp contrast to Hanushek's statement of uncertainty.

Other researchers, including Harold Wenglinsky (1996), went on to explore with greater precision the measures of financial inputs to schooling that are most strongly associated with

variations in student outcomes. Largely confirming the meta-analyses of Greenwald, Hedges, and Laine, Wenglinsky's analysis found that, "per-pupil expenditures for instruction and the administration of school districts are associated with achievement because both result in reduced class size, which raises achievement." (p. 221)[18]

More recent studies (later 1990s & early 2000s) examining the relationship between financial resources and student outcomes made incremental improvements to production function analyses by a) adjusting the value of the education dollar for regional cost variation;[19] b) testing alternative "functional forms" of the relationship between financial inputs and student outcomes; and c) applying other statistical corrections for the measurement of inputs.[20] These studies have invariably found a positive, statistically significant (though at times small) relationship between student achievement gains and financial inputs.

They also, however, raised new, important issues about the complexities of attempting to identify a direct link between money and student outcomes. These difficulties include equating the value of the dollar across widely varied geographic and economic contexts, as well as in accurately separating the role of expenditures from that of students' family backgrounds, which also play some role in determining local funding. Most of the studies included in Hanushek's review suffered from serious data and methodological limitations, which have since been addressed in more recent work.[21]

These studies have invariably found a positive, statistically significant (though at times small) relationship between student achievement gains and financial inputs.

Interest in direct dollar-to-outcomes analysis also stalled due to the imprecision of data on financial resources available to school sites and children. Most existing financial data continue to be reported at the school district level, but resources may vary widely across schools within these districts. As a result, questions about whether money matters are often restricted to linking district-level funding with student-level outcomes, which ignores the manner in which district funds are distributed between schools. School-site spending data are increasingly available, but have not generally been the subject of new production function studies. That is, few studies have as yet evaluated the relationship between school-level spending and student-level outcomes. Instead, researchers have increasingly focused on "within school" factors which are thought to influence student outcomes. This includes schooling resources, such as class sizes or teacher characteristics, that are often more easily linked (in datasets) to schools and classrooms.[22]

To summarize this discussion above on whether resources matter, it is important to recognize that Hanushek's original conclusion from 1986 was merely a statement of "uncertainty" about whether a *consistent* relationship exists between spending and student

outcomes – one that is big enough to be important. His conclusion was *not* that such a relationship does not exist. Nor was it a statement that schools with fewer resources are better, or that reducing funding can be an effective way to improve schools.

By the early 2000s, the cloud of uncertainty conjured by Hanushek in 1986 had largely lifted in the aftermath of the various, more rigorous studies that followed, with finance scholars using detailed datasets to examine more finely-grained relationships between money and student outcomes.

The uncertainty has been replaced with an empirically-grounded confidence that funding does matter.

Do Resources Matter?

Analyzing the relationship between *overall* spending and outcomes is a limited tool. Some things work and others do not – a high-spending state or district that allocates resources to ineffective policies might not show results, and vice-versa. In short, it's not just how much you spend, but how you spend it. Accordingly, both parallel with, and emergent from, the literature exploring whether aggregate measures of per-pupil spending are positively associated with student outcomes, there are now numerous studies of how specific schooling resources affect student outcomes. Typically, these studies have explored measures including (but not limited to):

1. Teacher salaries
2. Pupil to teacher ratios (class sizes)

Both of these resource measures have financial implications. Thus, it is natural, when exploring whether money matters, to explore whether *things that cost money* matter.[23]

Teacher wages and teacher quality

The Coleman report looked at a variety of specific schooling resource measures, most notably teacher characteristics, finding positive relationships between these traits and student outcomes. A multitude of studies on the relationship between teacher characteristics and student outcomes have followed, producing mixed messages as to which matter most and by how much.[24] Inconsistent findings on the relationship between teacher "effectiveness" and how teachers get paid – by experience and education – added fuel to "money doesn't matter" fire. Since a large proportion of school spending necessarily goes to teacher compensation, and (according to this argument) since we're not paying teachers in a manner that reflects or incentivizes their productivity, then spending more money won't help.[25] In other words, the assertion is that money spent on the current system doesn't matter, but it could if the system was to change.

Of course, in a sense, this is an argument that money *does* matter. But it also misses the important point about the role of experience and education in determining teachers' salaries, and what that means for student outcomes.

While teacher salary schedules may determine pay differentials across teachers *within* districts, the simple fact is that *where* one teaches is also very important in determining how much he or she makes.[26] Arguing over attributes that drive the raises in salary schedules also ignores the bigger question of whether paying teachers more in general might improve the quality of the workforce and, ultimately, student outcomes. Teacher pay is increasingly uncompetitive with that offered by other professions, and the "penalty" teachers pay increases the longer they stay on the job.[27]

In short, it's not just how much you spend, but how you spend it.

A substantial body of literature has accumulated to validate the conclusion that both teachers' overall wages and relative wages affect the quality of those who choose to enter the teaching profession, and whether they stay once they get in. For example, Murnane and Olson (1989) found that salaries affect the decision to enter teaching and the duration of the teaching career,[28] while Figlio (1997, 2002) and Ferguson (1991) concluded that higher salaries are associated with more qualified teachers.[29] In addition, more recent studies have tackled the specific issues of relative pay noted above. Loeb and Page showed that:

> "Once we adjust for labor market factors, we estimate that raising teacher wages by 10 percent reduces high school dropout rates by 3 percent to 4 percent. Our findings suggest that previous studies have failed to produce robust estimates because they lack adequate controls for non-wage aspects of teaching and market differences in alternative occupational opportunities."[30]

In short, while salaries are not the only factor involved, they do affect the quality of the teaching workforce, which in turn affects student outcomes.

Research on the flip side of this issue – evaluating spending constraints or reductions – reveals the potential harm to teaching quality that flows from leveling down or reducing spending. For example, David Figlio and Kim Rueben (2001) note that, "Using data from the National Center for Education Statistics we find that tax limits systematically reduce the average quality of education majors, as well as new public school teachers in states that have passed these limits."[31]

Salaries also play a potentially important role in improving the *equity* of student outcomes. While several studies show that higher salaries relative to labor market norms can draw higher quality candidates into teaching, the evidence also indicates that relative teacher salaries across schools and districts may influence the distribution of teaching quality. For example, Ondrich, Pas and Yinger (2008) "find that teachers in districts with higher salaries

relative to non-teaching salaries in the same county are less likely to leave teaching and that a teacher is less likely to change districts when he or she teaches in a district near the top of the teacher salary distribution in that county."[32]

With regard to teacher quality and school racial composition, Hanushek, Kain, and Rivkin (2004) note: "A school with 10 percent more black students would require about 10 percent higher salaries in order to neutralize the increased probability of leaving."[33] Others, however, point to the limited capacity of salary differentials to counteract attrition by compensating for working conditions.[34]

Finally, it bears noting that those who criticize the use of experience and education in determining teachers' salaries must of course produce a better alternative, and there is even less evidence behind increasingly popular ways to do so than there is to support the policies they intend to replace. In a perfect world, we could tie teacher pay directly to productivity, but contemporary efforts to do so, including performance bonuses based on student test results,[35] have thus far failed to produce concrete results in the U.S. More promising efforts to measure productivity, such as new teacher evaluations that incorporate heavily-weighted teacher productivity measures based on their students' test scores, are still a work in progress, and there is not yet evidence that they will be any more effective (or cost-effective) in attracting, developing or retaining high-quality teachers.

To summarize, despite all the uproar about paying teachers based on experience and education, and its misinterpretations in the context of the "Does money matter?" debate, this line of argument misses the point. To whatever degree teacher pay matters in attracting good people into the profession and keeping them around, it's less about *how* they are paid than *how much.* Furthermore, the average salaries of the teaching profession, with respect to other labor market opportunities, can substantively affect the quality of entrants to the teaching profession, applicants to preparation programs, and student outcomes. Diminishing resources for schools can constrain salaries and reduce the quality of the labor supply. Further, salary differentials between schools and districts might help to recruit or retain teachers in high need settings. In other words, resources used for teacher quality matter.

Class size & Teacher Quantity

Class size is often characterized as a particularly expensive use of additional school dollars.[36] Reducing class sizes obviously costs money, since you have to hire additional teachers, but the question of whether it's expensive must rely on detailed comparisons of alternative uses of the same dollars, or the effects on student outcomes of those alternative uses.

Instead, most arguments against class size reduction frequently proceed by noting that there are significant costs to adding more teachers and classrooms (which is, again, an unsurprising revelation) [37], followed by a (often vague) statement as to the differences between

the most and least "effective" teachers (as measured by their effects on test scores). The problem here is that one cannot compare the cost-effectiveness of class size reduction with "improving teacher quality," which an outcome, not a concrete policy with measurable costs and benefits.

What we do know, however, is that ample research indicates that children in smaller classes achieve better outcomes, both academic and otherwise, and that class size reduction can be an effective strategy for closing racial or socio-economic achievement gaps.[38] For example, Alan Krueger, in a re-analysis of data from the large-scale randomized Tennessee class size reduction study (Project STAR), concluded:

> "The main conclusions are 1) on average, performance on standardized tests increases by four percentile points the first year students attend small classes; 2) the test score advantage of students in small classes expands by about one percentile point per year in subsequent years; 3) teacher aides and measured teacher characteristics have little effect; 4) class size has a larger effect for minority students and those on free lunch."[39]

Among more recent studies on the topic, also re-evaluating the Tennessee STAR data, Konstantopolous and Chun (2009) summarized:

> "We used data from Project STAR and the Lasting Benefits Study to examine the long-term effects of small classes on the achievement gap in mathematics, reading, and science scores (Stanford Achievement Test). The results consistently indicated that all types of students benefit more in later grades from being in small classes in early grades. These positive effects are significant through grade 8. Longer periods in small classes produced higher increases in achievement in later grades for all types of students. For certain grades, in reading and science, low achievers seem to benefit more from being in small classes for longer periods. It appears that the lasting benefits of the cumulative effects of small classes may reduce the achievement gap in reading and science in some of the later grades."[40]

Admittedly, there are some naysayers on whether class size reduction yields cost-effective benefits in terms of student outcomes. But the findings upon which these counterarguments are based often lack the weight of large-scale randomized studies, such as Tennessee's Project STAR, relying instead on natural variations in class sizes across schools.[41]

It's true that a large body of the literature on the effectiveness of class size reduction relies on data from a relatively small handful of sources, most notably, the Tennessee STAR experiment.[42] Further, most class size reduction studies finding substantial benefits have focused on class size reduction in early grades (K-3), and most of these programs are pilots implemented on a relatively small scale. (A comprehensive review of the literature on class size reduction is beyond the scope of this brief, but see end note for additional resources.).[43]

It's also true that reducing class size costs more than not reducing class size. But class size reductions, implemented effectively, have positive effects. As such, one can reasonably infer that using increased resources to reduce class sizes would have positive effects, or that resources matter.

While it's certainly plausible that other uses of the same money might be equally or even more effective, there is little evidence to support this. For example, while we are quite confident that higher teacher salaries may lead to increases in the quality of applicants to the teaching profession and increases in student outcomes, we do not know whether the same money spent toward salary increases would achieve better or worse outcomes if it were spent toward class size reduction. Indeed, some have raised concerns that large scale-class size reductions can lead to unintended labor market consequences that offset some of the gains attributable to class size reduction (such as the inability to recruit enough fully qualified teachers).[44] And many, over time, have argued the need for more precise cost/benefit analysis. [45] Still, the preponderance of existing evidence suggests that the additional resources expended on class size reductions do result in positive effects.

Do School Finance Reforms Matter?

A particularly relevant question for informing the current "Does money matter?" debate is whether increased and sustained funding provided through state school finance reforms can improve the level or distribution of student outcomes, including both long-term outcomes and short-term shifts in academic achievement. In other words, does the manner in which states distribute money matter? And how can we tell? Findings regarding these specific questions might, most directly, inform state legislative debates over tax policy and education spending.

Most funding for public education comes from state and local sources, and is under the jurisdiction of state school finance systems. Therefore, states have the greatest control over whether local public schools have access to sufficient levels of resources, and whether those resources are distributed equitably across children and settings. Furthermore, constitutional protections for children's access to adequate and equitable public schooling exist in state constitutions, but not in the U.S. Constitution. Finally, as indicated at the outset of this brief, it is at the state level where the most raucous rhetoric is occurring around these questions of whether money matters in education. State legislatures and governors can make or break public schooling, and they have.[46]

Kevin Welner of the University of Colorado and I recently published an extensive review on this specific topic, which appears in the November 2011 issue of *Teachers College Record.* Among other things, we address the research complexities of answering questions about the efficacy of state school finance reforms. Those complexities can often be reduced to asking the right questions about a) whether substantive reforms were actually implemented; b) when they

were implemented and how long they were sustained; and c) who was most affected by the reforms.

As with other bodies of literature on the effectiveness of schooling resources, the research on state school finance reforms is a mixed bag in terms of analytic rigor. 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 and Missouri, or the court-ordered financing of urban districts in New Jersey.[47]

More recently, Eric Hanushek and a consulting defense attorney for states facing school funding challenges, Alfred Lindseth of Southerland-Asbill & Brennan, produced a book in which one chapter is dedicated to trying to prove that court-ordered school funding reforms in New Jersey, Wyoming, Kentucky, and Massachusetts resulted in few or no measurable improvements.[48] These conclusions, however, are based on little more than a series of graphs of student achievement on the National Assessment of Educational Progress in 1992 and 2007. The authors show little change in these states' scores, and conclude that the reforms didn't work.

In other words, the authors assume that, during this period, each of the four states infused substantial additional funds into public education in response to judicial orders, and that these funds were targeted at low-income and minority students.[49,50] They also necessarily assume that, in all other states which serve as a comparison group, similar changes did not occur. Yet they validate neither assertion.

In contrast, Kevin Welner and I review several studies applying more rigorous and appropriate methods for evaluating the influence of state school finance reforms. Among these analyses is one national study by Card and Payne (2002) which evaluates whether changes in spending inequality generally lead to changes in outcome inequality.[51] The authors measure both the extent and timing of changes in each. These analyses, while imperfect, rise to a level far above those conducted by Hanushek and Lindseth. Card and Payne found "evidence that equalization of spending levels leads to a narrowing of test score outcomes across family background groups."(p. 49)[52]

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 that include: a) the enormous diversity in the nature of state aid reform plans, and b) the paucity of national level student performance data.[53] Accordingly, more 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.

For instance, Roy (2011) published an analysis of the effects of Michigan's 1990s school finance reforms, which led to a significant increase among 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." (from abstract)[54]

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)[55]

A similar peer-reviewed article by 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 percent increase in spending was associated with a 5 percent increase in the likelihood of students going on to postsecondary education. (p. 275)[56]

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.

Elsewhere, two 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. They 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)[57] 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. Guryan 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 that a $1,000 increase in per-pupil spending leads to about a third to a half of a standard-deviation increase in average test scores. It is noted that the state aid driving the estimates is targeted to under-funded school districts, which may have atypical returns to additional expenditures." (p. 1)[58]

Finally, Downes conducted earlier studies of Vermont school finance reforms of the late 1990s (Act 60). In a 2004 book chapter, he 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)[59,60]

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 substantial positive effects on student outcomes, including reductions in both the levels and disparities in these outcomes. It is also safe to say that analyses provided in sources such as the book chapter by Hanushek and Lindseth (2009) and others [61] provide little credible evidence to the contrary, due to significant methodological omissions. In other words, not only does money matter, but reforms that determine how money is distributed matter too.

Summing up the Evidence

This brings me to a summary of the evidence on whether money matters in education. Despite the relative consistency of empirical findings over time regarding a) whether per-pupil spending itself is related to student outcomes; b) whether spending related resources, such as teacher wages or class sizes, are related to student outcomes; c) whether improving the adequacy and equity of school funding can have positive effects on student outcomes, a persistent cloud of doubt hangs over political deliberations on school funding. Here, I review briefly the sources of that doubt, relative to what we do know with some confidence, as well as what we still have yet to figure out about money and student outcomes.

What are/were the main sources of doubt?

The primary source of doubt to this day remains the above-mentioned Eric Hanushek finding, in 1986, that *"There appears to be no strong or systematic relationship between school expenditures and student performance." (p. 1162)*[62]

This single quote, now divorced entirely from the soundly-refuted analyses on which it was based, remains a mantra for those wishing to deny that increased funding for schools is a viable option for improving school quality. Add to this statement the occasional uninformative and inflammatory anecdote regarding urban district spending and student outcomes in places like Kansas City or New Jersey, or the frequently-recreated graphs showing spending and achievement over the past few decades, and one has a rhetorical war against an otherwise overwhelming body of empirical evidence.[63]

No rigorous empirical study of which I am aware validates that increased funding for schools in general, or targeted to specific populations, has led to any substantive, measured

reduction in student outcomes or other "harm." Arguably, if this were the case, it would open new doors to school finance litigation against states which choose to increase funding to schools. Twenty years ago, Richard Murnane summarized the issue exceptionally well, when he stated:

> "In my view, it is simply indefensible to use the results of quantitative studies of the relationship between school resources and student achievement as a basis for concluding that additional funds cannot help public school districts. Equally disturbing is the claim that the removal of funds... typically does no harm." (p. 457) [64]

Murnane's quote is as relevant today as it was then. The sources of doubt on the "Does money matter?" question are not credible.

What do we know?

Based on the studies reviewed in this brief, there are a few things we can say with confidence about the relationship between funding, resources, and student outcomes:

First, on average, even in large-scale studies across multiple contexts, aggregate measures of per-pupil spending are positively associated with improved and/or higher student outcomes. In some studies, the size of this effect is larger than in others. And, in some cases, additional funding appears to matter more for some students than others. Clearly, there are other factors that moderate the influence of funding on student outcomes, such as how that money is spent. But, on balance, in direct tests of the relationship between financial resources and student outcomes, money matters.

Second, schooling resources that cost money, including class size reductions and increased teacher compensation, are positively associated with student outcomes. Again, in some cases and for some populations, these effects are larger than for others. On balance, though, there are ways to spend money that have a solid track record of success. Further, while there may exist alternative uses of financial resources that yield comparable or better returns in student outcomes, no clear evidence identifies what these alternatives might be.

Third, sustained improvements to the level and distribution of funding across local public school districts can lead to improvements in the level and distribution of student outcomes. While money alone may not be the answer, adequate and equitable distributions of financial inputs to schooling provide a necessary underlying condition for improving adequacy and equity of outcomes. That is, if the money isn't there, schools and districts simply don't have a "leverage option" that can support strategies that might improve student outcomes. If the money is there, they can use it productively; if it's not, they can't. But, even if they have the money, there's no guarantee that they will. Evidence from Massachusetts, in particular, suggests that appropriate combinations of more funding with more accountability may be most promising.

What don't we know?

Indeed, there are many unanswered questions about how money matters, and how it can matter most. Specifically, while many talk of more efficient or cost effective options for spending money, information on these options is sorely lacking. Rhetoric abounds regarding current approaches to public schooling – such as spending on class size reduction – being the most inefficient or least cost-effective options. But proposed alternatives, such as restructuring teacher pay around indicators of "effectiveness" rather than seniority or credentials, are not backed by solid research , and include no serious evaluations of cost. Accordingly, they provide no legitimate basis for comparing cost-effectiveness.

While we do have evidence that increased salaries may improve the quality of the teacher workforce and student outcomes, we do not have sufficient evidence to determine whether or not the same dollar spent on salaries to "improve teacher quality" by some (often unstated) means would achieve better or worse outcomes than if that dollar was spent on a more proven intervention, such as class-size reductions. Moreover, even if there were evidence that some new policy was more cost-effective, this would actually represent an argument that money matters, not the opposite.

There is also limited evidence about the connection between funding and *longer-term* outcomes. In an era where educational output and outcomes are increasingly measured in terms of short-term changes in students' performance on standardized tests of reading and math, we have arguably lost sight of broader and/or intermediate- and long-term outcomes. We need to know more about the relationship between access to resources in preschool, elementary, and secondary schools and successful transitions to and completion of undergraduate education (and labor market outcomes). We do have a growing body of evidence that students' access to advanced coursework in mathematics does have a positive relationship to undergraduate success, and that access to a breadth of curricular and co-curricular opportunities increases college access.[65] And we know that such opportunities are inequitably distributed across children.[66] This research must expand to include a broader array of both inputs and outputs.

The primary problem is that state data systems provide limited capacity to track students from K-12 systems through college and into the workforce. Moreover, while the precision of financial data are improving in some regards, it remains difficult to tie district-level expenditure data to specific schools, programs, and classrooms, limiting the ability of researchers to explore more closely the relationship between spending patterns, resource allocation choices, and student outcomes. Hopefully, states will improve the quality and scope of their available data in the near future.

Concluding Thoughts

Given the preponderance of evidence that resources do matter and that state school finance reforms can effect changes in student outcomes, it seems somewhat surprising that not only has doubt persisted, but the rhetoric of doubt seems to have escalated. In many cases, there is no longer just doubt, but rather direct assertions that: schools can do more than they are currently doing with less than they presently spend; the suggestion that money is not a necessary underlying condition for school improvement; and, in the most extreme cases, that cuts to funding might actually stimulate improvements that past funding increases have failed to accomplish.

To be blunt, money does matter. Schools and districts with more money clearly have greater ability to provide higher-quality, broader, and deeper educational opportunities to the children they serve. Furthermore, in the absence of money, or in the aftermath of deep cuts to existing funding, schools are unable to do many of the things they need to do in order to maintain quality educational opportunities. Without funding, efficiency tradeoffs and innovations being broadly endorsed are suspect. One cannot tradeoff spending money on class size reductions against increasing teacher salaries to improve teacher quality if funding is not there for either – if class sizes are already large and teacher salaries non-competitive. While these are not the conditions faced by all districts, they are faced by many.

It is certainly reasonable to acknowledge that money, by itself, is not a comprehensive solution for improving school quality. Clearly, money can be spent poorly and have limited influence on school quality. Or, money can be spent well and have substantive positive influence. *But money that's not there can't do either.* The available evidence leaves little doubt: Sufficient financial resources are a necessary underlying condition for providing quality education.

Appendix: Methods and Measures in Money Matters Questions

Measuring the Inputs

In this appendix, in order to help readers better understand the methods used in the studies discussed in the main text of this paper, I provide a more detailed primer on studying the relationship between money and student outcomes.

Broadly, studies of the "Does money matter?" genre seek to determine whether differences or changes in access to *schooling inputs* are associated with or result in differences in or changes to *student outcomes*. Any such studies must therefore include some measures of *schooling inputs* and of *student outcomes.* In studies that might fall into the "Does money matter?" category, input measures can be roughly broken down into a) money itself, and b) things that cost money.

Money itself:

Per-pupil expenditure is a commonly-used measure of the aggregate level of financial resources available in public school districts. The measure typically includes all current operating expenditures of school districts divided by the numbers of children served – that is, the fiscal year spending on salaries and benefits for school employees, classroom materials supplies and equipment, and expenditures on utilities, maintenance and operations of facilities. But this measure is problematic on a number of levels. First, very few studies appropriately adjust the value of per-pupil spending for differences (such as levels of labor competition or other costs) across labor markets within states.[67] Second, some substantive differences in school district offerings which do cost money don't show up as per-pupil expenditure variation (such as the addition of pre-kindergarten programs, which adds both spending and students, often at lower per-pupil spending than occurs in upper grades). It is a substantive addition to the educational program which may, in some cases, reduce average per-pupil spending district-wide.

Components of per-pupil spending, such as "instructional spending" or "administrative spending," are also occasionally explored for their differential effects (if any) on student outcomes.[68] It is often presumed that "instructional spending" differences will be most related to student outcomes (where instructional spending is often described as "money to the classroom," consisting of teacher wages, materials, supplies, equipment, and classroom support staff).

Resources that cost money

Differences in school- and district-level instructional spending often boil down to differences in quantities of instructional staff and differences in the characteristics of those staff (most related to differences in salaries related to differences in years of experience and degree

levels). Quantities of instructional staff are most often measured in terms of class sizes or pupil-to-teacher ratios. To the extent that having a greater quantity of teachers affects student outcomes, then so too does having the money available to increase the quantity of teachers.

Teacher experience levels and teacher degree levels are also often studied in the context of the "Does money matter?" debate because, within traditional teacher salary schedules, more experienced teachers are generally paid higher salaries, as are teachers with more advanced degrees. To the extent that these characteristics are associated with differences in student outcomes, expenditures on these characteristics may be assumed to be associated with student outcomes.

One might also look specifically at comprehensive school reform models, some of which are noted for their resource intensiveness, such as Roots and Wings/Success for All,[69] or the more recently touted Apollo 20 Project in Houston, Texas.[70] To the extent that these models a) require greater expenditure than current levels, and b) result in better outcomes than current levels, a reasonable argument can be made that money spent on these reforms matters. Many comprehensive reform strategies embed some degree of additional staffing (instructional quantity) with some degrees of professional development (improving instructional quality) and the relative costs of these components may be distilled.

Measuring the Outcomes

Equally pertinent is the measurement of outcomes. Outcome measures in "Does money matter?" or "Does school quality matter?" studies tend to take three forms:

Short-term and concurrent academic achievement measures are most common in the past two decades, because of the increased availability of individual student-level data on academic achievement, largely from state data systems implemented for accountability purposes, but also from large national surveys, including the National Educational Longitudinal Study of the eighth grade class of 1988. Typically, when longitudinal data are available on individual students on measures of academic achievement, the goal is to determine the influence of differential school resources as a treatment, on gains in student achievement outcomes. Most commonly, the measured outcomes are for math and language arts.

Mid-term academic attainment measures include measures of high school graduation rates, transition to higher education, persistence in higher education (and completion of specific coursework and credits) and time to completion of postsecondary education. These intermediate measures of attainment are less common, perhaps due to the relatively limited availability of detailed individual-level data linking K-12 education system parameters and college attendance patterns of graduates of specific K-12 schools and districts.

Long-term economic benefit measures have been the focus of numerous large-scale economic studies of the influence of schooling quality. From an economic perspective, there is great

interest in validating that measurable differences in school quality or investment in schooling can ultimately have measurable effects on both individual wages and on the economy as a whole.

Research Methods for Linking the Two

A handful of research methods and statistical approaches have been used to evaluate the connection between schooling resources, money, and student outcomes. These methods may be broadly classified into those that involve studying the "natural variation" in schooling quality available to individuals, based on where they attend school, and studies that involve random assignment of students to receive specific reforms, strategies, or programs (with fiscal implications). Note that "natural variation" is a research euphemism for the vast systemic inequity of the American public education system. Studies of "natural variation" may explore differences across schooling contexts or changes in schooling quality over time, which are in effect, policy induced variations.

Studies relying on natural variation

Most studies exploring the relationship between existing differences in schooling resources and existing differences in student outcomes attempt to estimate some form of statistical model which relates a) student outcomes to b) financial or other schooling inputs, given c) background characteristics on student populations served, and d) contextual factors of schools and districts in which those students are served. When framed this way, the statistical models are "production function" models, or models of the production of student outcomes. [71] These studies seek to identify whether there exists a statistically significant relationship between the spending measures or other school resource measures and student outcomes, ideally measured at the individual student level and measured in terms of outcome gains. Further, even if statistically significant, it is important to know that a certain amount of differences in inputs is associated with a certain amount of difference in outcomes. That is to say, is the magnitude policy relevant? For example, how many more dollars does it take to improve achievement by a specific amount?

Numerous technical issues complicate these analyses, such as problems with fully accounting for "unobservable" differences in student backgrounds or schooling contexts, and difficulties determining what the right "shape" of the statistical relationship is between inputs and outcomes (for example, to what extent are there diminishing returns and when do they kick in?), each of which may compromise the validity of findings. [72]

Another type of model, not often discussed as a method for determining whether "money matters" is the education cost function.[73] The education cost function essentially turns the education production function around in an attempt to determine the a) costs per pupil of achieving b) desired educational outcome levels c) given the student populations served, and d) contextual factors such as differences in the prices of schooling inputs, economies of scale,

population sparsity and remoteness. In effect, these studies attempt to determine whether it costs more to achieve more, and how much, given the average existing practices of schooling.[74] In other words, does money matter?

Related studies of existing or historical variation of resources across children have explored the relationship between changes in the distribution or overall level of funding allocated by states to local public schools or districts and resulting changes in the level or distribution of student outcomes. For example, if a state allocates substantially more resources than in the past to low-wealth school districts, do student outcomes in those districts improve? These are policy-induced variations, or changes, but are not experiments. I refer to these studies as "Do school finance reforms matter?" studies, and they are a particularly relevant variation on the broader "does money matter?" question. They are important because state school finance policy is the primary vehicle for changing either the level or distribution of funds available to schools and districts, or altering in substantive ways the "natural variation" (inequity) of the system.

Studies relying on experiments

Finally, there are those studies which rely on what is considered the "gold standard" for research and evaluation of educational programs – experimental design studies. Experimental design studies randomly assign one group of students to receive a specific set of programs and services and another group of students to a control group, or one that does not receive the treatment of interest. Large-scale experimental design studies have been conducted to determine the effects of class size reduction on student outcomes, participation in preschool programs on student outcomes, and implementation of specific comprehensive school reform models[75] on student outcomes. That is, randomized trials are useful for studying specific reforms or models which may have cost implications. However, to the best of my knowledge, randomized trials have not been conducted to discern the importance of financial inputs to schooling directly, in part because doing so would severely deprive some students of resources, which would likely be objectionable to institutional review boards and the general citizenry. Though, arguably, permitting the persistence of extreme "natural variations" is no less objectionable.

End Notes

[1] http://nces.ed.gov/programs/digest/d06/tables/dt06_061.asp

[2] For a version of this argument, see: http://www.huffingtonpost.com/bill-gates/bill-gates-school-performance_b_829771.html. However, most characterizations of the extent of national average spending increase are grossly oversimplified.[2] Further, on average, student achievement on the National Assessment of Educational Progress (NAEP) has actually improved quite dramatically over time[2] and achievement gaps have narrowed.[2] For example, adjusting spending growth only for traditional inflation measures which account for changes in the prices of consumer goods, but do not account for a) changes in competitive wages of non-teachers which influence the ability of schools to recruit and retain teachers, which have far outpaced the consumer price index, b) changes in the range and level of outcomes desired of our students, which affects costs significantly, and c) changes in the demographics of the student population, which affects the cost of achieving even constant outcome objectives.

http://www.epi.org/publication/fact-challenged_policy/

http://www.ets.org/Media/Research/pdf/PICBWGAP.pdf

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

[4] http://www.governor.ny.gov/sl2/stateofthestate2011transcript

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

[6] Baker and Welner explain how the U.S. Department of Education has recently established a web site on improving educational productivity, with specific intent to inform state policy and local practice. But, as Baker and Welner note, the materials on the web site:

"None of the materials listed or recommendations expressed within those materials are backed by substantive analyses of the cost effectiveness or efficiency of public schools, of practices within public schools, of broader policies pertaining to public schools, or of resource allocation strategies. Instead, the sources listed on the site's "resources" page are speculative think tank reports and related documents that do not include or even cite the types of analyses that would need to be conducted to arrive at their conclusions and policy recommendations."

Baker, B.D., Welner, K.G. (2011) Evidence and Rigor: A Call for the U.S. Department of Education to Embrace High Quality Research. National Education Policy Center.

[7] The scope of this review is limited to domestic studies. The emphasis of the review is on major peer reviewed studies in each of the 3 categories listed. Further, the emphasis is on studies that use data aggregated to no higher level than local public school districts. That is, no cross state or cross-national aggregate analyses are emphasized, though some are listed to point out their existence. For the older production function literature, the bulk of the discussion herein focuses on major meta-analyses published in the late 1980s to late 1990s, which reviewed studies from prior years. I do not reinvestigate those prior studies but do refer to some throughout. This review contains only a selected summary of major works on topics such as class size and teacher characteristics which have financial implications. For studies of state school finance reforms to be included, the studies must measure more than the mere presence, or nominal indication that reform happened. Further, studies are addressed if the attempt to measure the relationship between changes in the level of financial resources for

students in particular settings (districts, schools) and subsequent changes in the level of outcomes, or changes in the distribution of schooling resources and distributions of student outcomes. Only studies using short term academic outcomes (measured achievement, aptitude, and graduation rates) are included. Preference is given to peer reviewed studies and studies attempting to validate statistically a link between changes in the level or distribution of funding and the level or distribution of outcomes.

[8] Coleman, James S., Ernest Q. Campbell, Carl F. Hobson, James McPartland, Alexander M. Mood, et al. (1966) Equality of Educational Opportunity. Washington: U. S. Office of Education.

[9] For an early discussion of the Coleman findings and misinterpretations of those findings with respect to policy implications, see:

Kain, G.C., Watts, H.W. (1970) Problems in Making Policy Inferences from the Coleman Report. American Sociological Review, 35 (2) 228-242

Bowles, S., Levin, H.M. (1968) The Determinants of Scholastic Achievement-An Appraisal of Some Recent Evidence. The Journal of Human Resources, 3 (1)-24

[10] Konstantopolous, S., Borman, G. (2011) Family Background and School Effects on Student Achievement: A Multilevel Analysis of the Coleman Data. Teachers College Record. 113 (1) 97-132

[11] Borman, G.D., Dowling, M. (2010) Schools and Inequality: A Multilevel Analysis of Coleman's Equality of Educational Opportunity Data. Teachers College Record. 112 (5) 1201-1246

[12] Card, D., Krueger, A. (1992) Does School Quality Matter? Returns to Education and the Characteristics of Schools in the United States. Journal of Political Economy. 100 (1) 1-40. In a paper from a few years later, Card and Krueger present a more tentative position on whether schooling resources are clearly linked to earnings and attainment, a more specific question. They note:

"Does the literature on school resources, earnings and educational attainment prove beyond a reasonable doubt that resources matter? We do not believe that the evidence justifies so strong a conclusion. The available evidence is not unambiguous or ubiquitous, and it suffers from all the standard criticisms of drawing causal inferences from observational data."

See: Card, D., Krueger, A. (1996) School Resources and Student Outcomes: An overview of the literature and new evidence from North and South Carolina. Journal of Economic Perspectives 10 (4) 31-50.

[13] Betts, J. (1996) Is There a Link between School Inputs and Earnings? Fresh Scrutiny of an Old Literature," in Gary Burtless, ed., *Does Money Matter? The Effect of School Resources on Student Achievement and Adult Success*. Washington, D.C.: Brookings Institution, 1996a, pp. 141-91.

[14] A later article by Hanushek, reiterating and updating his earlier findings also shows up as widely cited in the Social Science Citation Index:

Hanushek, E.A. (1997) Assessing the Effects of School Resources on Student Performance: An update. Educational Evaluation and Policy ANlaysis 19 (2) 141-164

[15] Hanushek, E.A. (1986) Economics of Schooling: Production and Efficiency in Public Schools. Journal of Economic Literature 24 (3) 1141-1177. A few years later, Hanushek paraphrased this conclusion in another widely cited article as "Variations in school expenditures are not systematically related to variations in student performance"

Hanushek, E.A. (1989) The impact of differential expenditures on school performance. Educational Researcher. 18 (4) 45-62

Hanushek describes the collection of studies relating spending and outcomes as follows:

"The studies are almost evenly divided between studies of individual student performance and aggregate performance in schools or districts. Ninety-six of the 147 studies measure output by score on some standardized test. Approximately 40 percent are based upon variations in performance within single districts while the remainder look across districts. Three-fifths look at secondary performance (grades 7-12) with the rest concentrating on elementary student performance." (fn #25)

[16] Greenwald and colleagues explain:

"studies in the universe Hanushek (1989) constructed were assessed for quality. Of the 38 studies, 9 were discarded due to weaknesses identified in the decision rules for inclusion described below. While the remaining 29 studies were retained, many equations and coefficients failed to satisfy the decision rules we employed. Thus, while more than three quarters of the studies were retained, the number of coefficients from Hanushek's universe was reduced by two thirds." (p. 363)

Greenwald and colleagues further explain that:

"Hanushek's synthesis method, vote counting, consists of categorizing, by significance and direction, the relationships between school resource inputs and student outcomes (including but not limited to achievement). Unfortunately, vote-counting is known to be a rather insensitive procedure for summarizing results. It is now rarely used in areas of empirical research where sophisticated synthesis of research is expected." (p. 362)

Hanushek (1997) provides his rebuttal to some of these arguments, and Hanushek returns to his "uncertainty position:

"The close to 400 studies of student achievement demonstrate that there is not a strong or consistent relationship between student performance and school resources, at least after variations in family inputs are taken into account." (p. 141)

Hanushek, E.A. (1997) Assessing the Effects of School Resources on Student Performance: An update. Educational Evaluation and Policy Analysis 19 (2) 141-164

See also:

Hanushek, Eric A. "Money Might Matter Somewhere: A Response to Hedges, Laine and

Greenwald." *Educational Researcher*, May 1994, 23, pp. 5-8.

[17] Greenwald, R., Hedges, L., Laine, R. (1996) The Effect of School Resources on Student Achievement. Review of Educational Research 66 (3) 361-396

[18] Wenglinsky, H. (1997) How Money Matters: The effect of school district spending on academic achievement. Sociology of Education 70 (3) 221-237

[19] Taylor. C. (1998) Does Money Matter? An Empirical Study Introducing Resource Costs and Student Needs into Educational Production Function Analysis. In U.S. Department of Education. National Center for Education Statistics. *Developments in School Finance, 1997.*

[20] Baker, B.D. (2001) Can flexible non-linear modeling tell us anything new about educational productivity? *Economics of Education Review* 20 (1) 81-92.

Figlio, D. N. (1999). Functional form and the estimated effects of school resources. *Economics of Education Review, 18* (2), 242–252.

Dewey, J., Husted, T., Kenny, L. (2000) The ineffectiveness of school inputs: a product of misspecification. Economics of education Review 19 (1) 27-45

[21] Specifically, Dewey and colleagues explain that many previous studies attempting to distill school resource effects on student outcomes concurrently correct for economic background of students. But that the economic background measures such as family income are also strong determinants of the demand for schooling resources. Thus, including the two simultaneously in regression models violates both conceptual appropriateness (resource levels are endogenous to family characteristics) and also violates statistical properties associated with those conceptual problems (that the error term is correlated with the school input measures, requiring a different statistical approach). Dewey and colleagues review the previous studies summarized by Hanushek, identifying that several suffer from this problem and that those which do tend to understate the influence of resources. Then Dewey and colleagues estimate alternative production functions:

We conducted our own empirical analysis using the Project TALENT student-level data set from 1960 and pooled state data for 1987–1992. In regressions from both data sets that were not plagued by misspecification, there is evidence that each school input had an impact on achievement. (p. 42)

Figlio's study of alternative specifications of the "shape" of the relationship between money and outcomes raises similar issues about previous literature including studies summarized by Hanushek, as does Corrine Taylor's analysis which applies adjustments for the costs of hiring teachers.

Indeed, many of the same studies considered rigorous enough for inclusion in Greenwald and colleagues analyses also suffer from the problems addressed by Husted and Kenny, and by Taylor (geographic cost adjustment) and Figlio. But, note that in each case, Dewey and colleagues, Taylor and Figlio find that when applying functional form and labor cost corrections, they tend to find stronger effects of schooling resources – specifically money. So, one might then argue that Greenwald and colleagues decisively positive findings are in fact, understated.

In conducting this review, I went back to a handful of the original studies summarized by Hanushek (1986) and listed in the sources note to Table 8 of that article. Several were not easily accessible, having been non-peer reviewed reports and doctoral theses. But among those available, consistent with the findings of Husted and Kenny, none attempted to account for the endogeneity of expenditures, often either evaluating simple correlations between spending and outcome measures (thus suffering significant omitted variables bias) or including a spending measure alongside determinants of spending. Arguably teacher characteristics including teacher salaries are also endogenous to local demand factors.

Original Hanushek studies reviewed:

Boardman, A., Davis, O., Sanday, P. (1977) A simultaneous equations model of the educational process. Journal of Public Economics 7 (1) 23-49

This study does not explore expenditures directly, but does include measures of schooling facilities and teacher characteristics, but not salary. Thus regional cost variation is less (or not) for the value of teacher salaries or education spending is less at issue. The authors of this study find that "many educational outputs jointly determine one another. Also, the results suggest that school and teacher variables have important effects on educational outcomes." (p. 23)

Johnson, G.E., Stafford, F.P. (1973) Social Returns to Quantity and Quality of Schooling. The Journal of Human Resources 8(2) 139-155

In this study, the authors find "high but diminishing marginal returns to investment in expenditures per pupil per year." P. 139 This is among the studies that arguably understates the sensitivity of expenditures to outcomes by inclusion of the spending measure (natural log of expenditures) in the model with determinants of expenditure (family socio-economic status). In addition, the model uses a national sample, but fails to control for regional variation in the value of expenditures.

Link, C.R., Ratledge, E.C. (1975) Social Returns to Quantity and Quality of Education: A Further Statement. The Journal of Human Resources, 10 (1) 78-89

Link and Ratledge find "Large but diminishing returns to incremental expenditures are observed." (p. 78) Link and Ratledge also use national survey data (National Longitudinal Study of the Labor Force). For the expenditure measure, like the above study, they use a measure of the 1968 district level per-pupil expenditures (natural logarithm) and also do not correct for regional variation, though some of the urbanicity variables included may capture a portion of this variation (unintentionally). The endogeneity problems are less clear in this study, because in place of controlling for direct demand determinants (family income, education) the authors control for individual IQ. However, IQ is arguably simultaneously determined with education spending, both IQ and school spending being a function of parental economic status and education level. Sensitive to this point, the authors explore direct and indirect effects of IQ, years of education (ED) and expenditures.

Raymond, R. (1968) Determinants of the Quality of Primary and Secondary Public Education in West Virginia. The Journal of Human Resources, 3 (4) 450-470

Raymond studied 5,000 students in West Virginia. Raymond did not explore per-pupil expenditures, but did explore several teacher salary measures, but does not correct for regional variation in the value of those salaries across West Virginia. Raymond finds salaries to be associated with output measures of quality.

Ribich, T.I., Murphy, J.L. (1975) The Economic Returns to Increased Educational Spending. The Journal of Human Resources, 10 (1) 56-77

Ribich and Murphy used data from the national Project Talent survey. Ribich and Murphy found "School expenditures are found to influence how many years of schooling an individual eventually receives, and the chief effect of spending differences on lifetime income is found to work through this school continuation link." (p. 56) Ribich and Murphy partly (though far from completely) correct for regional differences in the value of expenditures by including region variables. But, regression estimates likely suffer endogeneity addressed by Dewey, Husted and Kenny (including both family socioeconomic measures and expenditures alongside one another). Interestingly, the authors instead attribute the insensitivity of their outcome measures to spending (when directly estimated including all regions) to regional differences, specifically racial differences within southern states.

Welch, F. (1966) Measurement of the Quality of Schooling. The American Economic Review, 56 (1/2). 379-392

This study explored the return to elementary and secondary schooling of the male rural farm population in 1959, focusing on those who had not attended college in an effort to isolate differences in elementary and secondary schooling quality. This study is problematic on a number of levels when viewed in hind-sight.

First, the ultimate analysis of factors associated with the quality of schooling is aggregated to the state level (and noted by the author as a significant limitation). Second, expenditure measures are included in models with a) potential determinants of expenditures (racial composition, labor composition, enrollment per secondary school) and b) schooling resources dependent on expenditures (salaries, staff per 100 pupils) (see regression output in Table 4, p. 390). Further, expenditures are not adjusted for regional differences in value, nor are salaries.

[22] In tangentially related work, Hanushek, Rivkin and Taylor (1996) explore the influence of aggregation bias and omitted variables on estimates of the relationship between teacher characteristics and student outcomes, using data from the High School and Beyond survey. They find that at higher levels of aggregation, studies tend to overstate the strength of the relationship between resources and student outcomes, but raise the most significant concerns about studies using data aggregated to the state level with crude aggregate state level measures of student and population characteristics, far beyond the aggregation of most recent studies.

Hanushek, E.A., Rivkin, S., Taylor, L.L. (1996) Aggregation Bias and the Estimated Effects of School Resources. Review of Economics and Statistics. 78 (4) 611-27

Along these lines, there does exist a separate body of literature which endeavors to prove that education spending is not associated with student outcomes by making national aggregate comparisons of spending and outcomes. That is, by showing that on average, countries that spend more per pupil don't perform better on international assessments. See, for example:

Walberg, H.J. (1998) Spending More While Learning Less. Fordham Report. Vol. 2 Num. 6. Thomas B. Fordham Institute.

These studies suffer sufficiently from aggregation issues to be of little importance to the discussion herein. While aggregation might lead to overstating the money-outcome relationship in some studies, these studies also suffer from numerous substantial measurement problems regarding both input and outcome measures. For example, education spending data are simply not directly comparable across nations partly because they include vastly different programs and services (athletics, arts, special education) as well as other specific expenses such as health insurance costs for U.S. school employees which may be covered via other government programs in other nations.

[23] Hanushek (1986) explains:

"Thus the basic determinants of instructional expenditures in a district are teacher experience, teacher education and class size, and most studies, regardless of what other descriptors of schools might be included, will analyze the effect of these factors on outcomes." (p. 1160)

[24] Hanushek, E.A. (1971) Teacher Characteristics and Gains in Student Achievement: Estimation Using MicroData. Econometrica 61 (2) 280-288

Clotfelter, C.T., Ladd, H.F., Vigdor, J.L. (2007) Teacher credentials and student achievement: Longitudinal analysis with student fixed effects. Economics of Education Review 26 (2007) 673–682

Goldhaber, D., Brewer, D. (1997) Why Don't Schools and Teachers Seem to Matter? Assessing the Impact of Unobservables on Educational Productivity. The Journal of Human Resources, 332 (3) 505-523

Ehrenberg, R. G., & Brewer, D. J. (1994). Do school and teacher characteristics matter? Evidence from High School and Beyond. *Economics of Education Review, 13*(1), 1-17.

Ehrenberg, R. G., & Brewer, D. J. (1995). Did teachers' verbal ability and race matter in the 1960s? *Economics of Education Review, 14*(1), 1-21.

Jepsen, C. (2005). Teacher characteristics and student achievement: Evidence from teacher surveys. *Journal of Urban Economics, 57*(2), 302-319.

Jacob, B. A., & Lefgren, L. (2004). The impact of teacher training on student achievement: Quasi-experimental evidence from school reform. *Journal of Human Resources, 39*(1),50-79.

Rivkin, S. G., Hanushek, E. A., & Kain, J. F. (2005). Teachers, schools, and academic achievement. *Econometrica, 73*(2), 471.

Wayne, A. J., & Youngs, P. (2003). Teacher characteristics and student achievement gains. *Review of Educational Research, 73*(1), 89-122.

For a recent review of studies on the returns to teacher experience, see:

Rice, J.K. (2010) The Impact of Teacher Experience: Examining the Evidence and Policy Implications. National Center for Analysis of Longitudinal Data in Educational Research.

[25] Some go so far as to argue that half or more of teacher pay is allocated to "non-productive" teacher attributes, and so it follows that that entire amount of funding could be reallocated toward making schools more productive.

See, for example, a recent presentation to the NY State Board of Regents from September 13, 2011 (page 32), slides by Stephen Frank of Education Resource Strategies: http://www.p12.nysed.gov/mgtserv/docs/SchoolFinanceForHighAchievement.pdf

[26] Lankford, H., Loeb., S., Wyckoff, J. (2002) Teacher Sorting and the Plight of Urban Schools. Educational Evaluation and Policy Analysis *24 (1) 37-62*

[27] Allegretto, S.A., Corcoran, S.P., Mishel, L.R. (2008) The teaching penalty : teacher pay losing ground. Washington, D.C. : Economic Policy Institute, ©2008.

[28] Richard J. Murnane and Randall Olsen (1989) The effects of salaries and opportunity costs on length of state in teaching. Evidence from Michigan. *Review of Economics and Statistics* 71 (2) 347-352

[29] David N. Figlio (2002) Can Public Schools Buy Better-Qualified Teachers?" *Industrial and Labor Relations Review* 55, 686-699. David N. Figlio (1997) Teacher Salaries and Teacher Quality. Economics Letters 55 267-271. Ronald Ferguson (1991) Paying for Public Education: New Evidence on How and Why Money Matters. Harvard Journal on Legislation. 28 (2) 465-498.

[30] Loeb, S., Page, M. (2000) Examining the Link Between Teacher Wages and Student Outcomes: The Importance of Alternative Labor Market Opportunities and Non-Pecuniary Variation. Review of Economics and Statistics 82 (3) 393-408

[31] Figlio, D.N., Rueben, K. (2001) Tax Limits and the Qualifications of New Teachers. Journal of Public Economics. April, 49-71

See also:

Downes, T. A. Figlio, D. N. (1999) Do Tax and Expenditure Limits Provide a Free Lunch? Evidence on the Link Between Limits and Public Sector Service Quality52 (1) 113-128

[32] Ondrich, J., Pas, E., Yinger, J. (2008) The Determinants of Teacher Attrition in Upstate New York. Public Finance Review 36 (1) 112-144

[33] Hanushek, Kain, Rivkin, "Why Public Schools Lose Teachers," Journal of Human Resources 39 (2) p. 350

[34] Clotfelter, C., Ladd, H.F., Vigdor, J. (2011) Teacher Mobility, School Segregation and Pay Based Policies to Level the Playing Field. Education Finance and Policy , Vol.6, No.3, Pages 399–438

Clotfelter, Charles T., Elizabeth Glennie, Helen F. Ladd, and Jacob L. Vigdor. 2008. Would higher salaries keep teachers in high-poverty schools? Evidence from a policy intervention in North Carolina. *Journal of Public Economics* 92: 1352–70.

[35] For recent studies specifically on the topic of "merit pay," each of which generally finds no positive effects of merit pay on student outcomes, see:

Glazerman, S., Seifullah, A. (2010) *An Evaluation of the Teacher Advancement Program in Chicago: Year Two Impact Report*. Mathematica Policy Research Institute. 6319-520

Springer, M.G., Ballou, D., Hamilton, L., Le, V., Lockwood, J.R., McCaffrey, D., Pepper, M., and Stecher, B. (2010). *Teacher Pay for Performance: Experimental Evidence from the Project on Incentives in Teaching*. Nashville, TN: National Center on Performance Incentives at Vanderbilt University.

Marsh, J. A., Springer, M. G., McCaffrey, D. F., Yuan, K., Epstein, S., Koppich, J., Kalra, N., DiMartino, C., & Peng, A. (2011). *A Big Apple for Educators: New York City's Experiment with Schoolwide Performance Bonuses. Final Evaluation Report*. RAND Corporation & Vanderbilt University.

[36] http://www.americanprogress.org/issues/2011/04/pdf/class_size.pdf

[37] See, for example:

Brewer, D.J., Kropp, C.K, Gill, B.P., Reichardt, R. (1999) Estimating the Cost of National Class Size Reductions Under Different Policy Alternatives. Educational Evaluation and Policy Anlaysis. 21 (2) 171-192

While this article provides insights into the cumulative costs of adding large numbers of teachers, it makes no comparisons to other strategies that might be employed for the same dollar. The article acknowledges the research on positive effects of class size and then estimates large scale implementation costs seemingly implying either that achieving these positive effects is simply too expensive or that there might be more cost effective uses of the same dollar.

[38] See http://www2.ed.gov/rschstat/research/pubs/rigorousevid/rigorousevid.pdf;

Jeremy D. Finn and Charles M. Achilles, "Tennessee's Class Size Study: Findings, Implications, Misconceptions," *Educational Evaluation and Policy Analysis*, 21, no. 2 (Summer 2009): 97-109;

Jeremy Finn et. al, "The Enduring Effects of Small Classes," *Teachers College Record,* 103, no. 2, (April 2001): 145–183; http://www.tcrecord.org/pdf/10725.pdf;

Alan Krueger, "Would Smaller Class Sizes Help Close the Black-White Achievement Gap." Working Paper #451 (Princeton, NJ: Industrial Relations Section, Department of Economics, Princeton University, 2001) http://www.irs.princeton.edu/pubs/working_papers.html;

Henry M. Levin, "The Public Returns to Public Educational Investments in African American Males," Dijon Conference, University of Bourgogne, France. May 2006. http://www.u-bourgogne.fr/colloque-iredu/posterscom/communications/LEVIN.pdf;

Spyros Konstantopoulos Spyros and Vicki Chun, "What Are the Long-Term Effects of Small Classes on the Achievement Gap? Evidence from the Lasting Benefits Study," *American Journal of Education* 116, no. 1 (November 2009): 125-154.

[39] Krueger, A. (1999) Experimental Estimates of Education Production Functions. The Quarterly Journal of Economics 114 (2) 497-532

[40] Spyros Konstantopoulos Spyros and Vicki Chun, "What Are the Long-Term Effects of Small Classes on the Achievement Gap? Evidence from the Lasting Benefits Study," *American Journal of Education* 116, no. 1 (November 2009): 125-154.

[41] Another relevant study showing positive effects of pupil to teacher ratio reduction (different from class size) is the Wisconsin SAGE study. See:

Molnar, A., Smith, P., Zahorik, J., Palmer, A., Halbach, A., Ehrle, K. (1999) Evaluating the SAGE Program: A Pilot Program in Targeted Pupil-Teacher Reduction in Wisconsin. Educational Evaluation and Policy Analysis 21 (2) 165-177

Unlike STAR which was a true randomized experiment in Tennessee, SAGE in Wisconsin was designed as "a 5-year K–3 pilot project that began in the 1996–97 school year. The program required that participating schools implement 4 interventions including reducing the pupil-teacher ratio within classrooms to 15 students per teacher." (p. 165) Molnar and colleagues found ". Results of the 1996-97 and 1997-98 first grade data reveal findings consistent with the Tennessee STAR class size experiment." (p. 165)

For an example of a study based on natural variation, finding no positive effects of smaller class size:

Hoxby, C.M. (2000) The Effects of Class Size on Student Achievement: New Evidence from Population Variation. Quarterly Journal of Economics. 115 (4) 1239-1285

Hoxby uses grade level, not student level, data on 649 elementary schools in Connecticut, concluding "class size does not have a statistically significant effect on student achievement" (p. 1239)

[42] Including recent work linking participation in smaller class sizes with post-secondary degree attainment:

Dynarski, S., Hyman, J.M., Whitmore Schazenbach, D. (2011) Experimental Evidence on the Effect of Childhood Investments on Postsecondary Attainment and Degree Completion. Cambridge, MA. NBER Working Paper 17533. http://www.nber.org/papers/w17533

[43] For other relatively recent studies on Class Size Reduction, see:

Chetty, R., Friedman, J.N., Hilger, N., Saez, E., Schazenbach, D.W., Yagan, D. (2010) How Does Your Kindergarten Classroom Affect Your Earnings? Evidence from Project STAR. Cambridge, MA: NBER Working Paper 16381 http://www.nber.org/papers/w16381

Blatchford, Peter; Bassett, Paul; Brown, Penelope (2005) Teachers' and Pupils' Behavior in Large and Small Classes: A Systematic Observation Study of Pupils Aged 10 and 11 Years. Journal of Educational Psychology, Vol 97(3), Aug 2005, 454-467. doi: 10.1037/0022-0663.97.3.454

Babcock, P., Betts, J. (2009) Reduced Class Size Distinctions: Effort, Ability and the Education Production Function. Cambridge, MA: NBER Working Paper #14777 http://www.nber.org/papers/w14777

Lubienski, S.T., Lubienski, C., Crawford-Crane, C. (2008) Achievement Differences and School Type: The Role of School Climate, Teacher Certification, and Instruction. American Journal of Education 115. 97-138

[44] Jepsen, C., Rivkin, S. (2002) What is the Tradeoff Between Smaller Classes and Teacher Quality? NBER Working Paper # 9205, Cambridge, MA. http://www.nber.org/papers/w9205

"The results show that, all else equal, smaller classes raise third-grade mathematics and reading achievement, particularly for lower-income students. However, the expansion of the teaching force required to staff the additional classrooms appears to have led to a deterioration in average teacher quality in schools serving a predominantly black student body. This deterioration partially or, in some cases, fully offset the benefits of smaller classes, demonstrating the importance of considering all implications of any policy change." p. 1

For further discussion of the complexities of evaluating class size reduction in a dynamic policy context, see:

David Sims, "A Strategic Response to Class Size Reduction: Combination Classes and Student Achievement in California," *Journal of Policy Analysis and Management*, 27(3) (2008): 457–478

David Sims, "Crowding Peter to Educate Paul: Lessons from a Class Size Reduction Externality," *Economics of Education Review*, 28 (2009): 465–473.

Matthew M. Chingos, "The Impact of a Universal Class-Size Reduction Policy: Evidence from Florida's Statewide Mandate," Program on Education Policy and Governance Working Paper 10-03 (2010).

[45] Ehrenberg, R.G., Brewer, D., Gamoran, A., Willms, J.D. (2001) Class Size and Student Achievement. Psychological Science in the Public Interest 2 (1) 1-30

[46] See Baker, B.D., Farrie, D., Sciarra, D., Coley, R., (2010) Is School Funding Fair. www.schoolfundingfairness.org

[47] Two reports from Cato are illustrative:

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

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

Edspresso (2006, October 31). *New Jersey learns Kansas City's lessons the hard way*. Retrieved October 23, 2009, from http://www.edspresso.com/index.php/2006/10/new-jersey-learns-kansas-citys-lessons-the-hard-way-2/

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

[49] Kevin Welner and I 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. We point out that in New Jersey, for example, infusion of funding occurred from 1998 to 2003 (or 2005), thus Hanushek and Lindseth's window includes 6 years on the front end where little change occurred (When?). Kentucky reforms had largely faded by the mid to late 1990s, yet Hanushek and Lindseth measure post reform effects in 2007 (When?). Further, in New Jersey, funding was infused into approximately 30 specific districts, but Hanushek and Lindseth explore overall changes to outcomes among low-income children and minorities using NAEP data, where some of these children attend the districts receiving additional support but many did not (Who?). In short the slipshod comparisons made by Hanushek and Lindseth provide no reasonable basis for asserting either the success or failures of state school finance reforms.

We also discuss other studies which involve similar flaws of reasoning. For example, Greene and Trivitt present a study in which they claim to show that court ordered school finance reforms let to no substantive improvements in student outcomes. However, the authors test only whether the presence of a court order is

associated with changes in outcomes, and never once measure whether substantive school finance reforms followed the court order. See:

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

In equally problematic analysis, Florence Neymotin 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, Kevin Welner and I explain that 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.

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

[50] In an earlier, edited volume, Hanushek goes so far as to title the book "How School Finance Lawsuits Exploit Judges' Good Intentions and **Harm Our Children."** (emphasis added) 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. That is, adding an element of fear to the cloud of doubt.

See, for example: E.A. Hanushek (2006) Courting Failure: How School Finance Lawsuits Exploit Judges' Good Intentions and Harm Our Children. Hoover Institution Press.

A review of the book is available here: http://www.tcrecord.org/Content.asp?ContentId=13382

This 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. The implication would be that if such schools exist, money must not matter. See:

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

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

[51] For additional discussion of the strengths and weakness of this particular study see Baker & Welner (2011).

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

See Baker and Welner (2011) for a more thorough discussion of the Card and Payne analysis, its strengths and weaknesses.

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

This synopsis of Figlio's main points actually comes from an earlier chapter in the same volume, by volume editor John Yinger:

Yinger, J. (2004) State Aid and the Pursuit of Educational Equity: An Overview. In J. Yinger (ed) p. 3-58 Helping Children Left Behind: State Aid and the Pursuit of Educational Equity. MIT Press. (p. 39)

[54] Roy, J. (2003). Impact of School Finance Reform on Resource Equalization and Academic Performance: Evidence from Michigan. Princeton University, Education Research Section Working Paper No. 8. Retrieved October 23, 2009 from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=630121(Forthcoming in Education Finance and Policy.)

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

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

Leuven, E., Lindahl, M., Oosterbeek, H., and Webbink, D. (2007). The Effect of Extra Funding for Disadvantaged Pupils on Achievement. *The Review of Economics and Statistics, 89*(4), 721-736.

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

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

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

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, S., Vachharajani, V. (2004) Money for Nothing: The Failures of Education Reform in Massachusetts http://www.beaconhill.org/BHIStudies/EdStudy5_2004/BHIEdStudy52004.pdf

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

[60] Two 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 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.

Resch, A. M. (2008). *Three Essays on Resources in Education* (dissertation). Ann Arbor: University of Michigan, Department of Economics. Retrieved October 28, 2009, from http://deepblue.lib.umich.edu/bitstream/2027.42/61592/1/aresch_1.pdf

Goertz, M., and Weiss, M. (2009). Assessing Success in School Finance Litigation: The Case of New Jersey. New York City: The Campaign for Educational Equity, Teachers College, Columbia University.

The authors 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).

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

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

See our critique of these studies in:

Baker, B.D., Welner, K.G. (2011) Do School Finance Reforms Matter and How Can We Tell? Teachers College Record. Nov. 2011.

[62] Hanushek, E.A. (1986) Economics of Schooling: Production and Efficiency in Public Schools. Journal of Economic Literature 24 (3) 1141-1177. A few years later, Hanushek paraphrased this conclusion in another widely cited article as "Variations in school expenditures are not systematically related to variations in student performance"

Hanushek, E.A. (1989) The impact of differential expenditures on school performance. Educational Researcher. 18 (4) 45-62

[63] Kevin Welner and I discuss at length Hanushek and Lindseth's strange heavy reliance on these two Cato reports from the late 1990s on Kansas City and New Jersey, as if these reports are the seminal works of the field. Yet, amazingly, Hanushek and Lindseth ignore outright most of the major peer reviewed articles on school finance reform by credible researchers using credible methods, addressed herein and addressed in my article with Kevin Welner.

Baker, B.D., Welner, K.G. (2011) Do School Finance Reforms Matter and How Can We Tell? Teachers College Record. Nov. 2011.

For example, in a Hoover Institution commentary regarding school funding litigation in New York State, Hanushek (2002) noted:

One need only look at the results in Kansas City. A school desegregation ruling in the 1980s began a period of more than a decade when the schools had access to virtually unlimited state funds. The dreams of school personnel did not translate into any measurable gains in student performance, even as their schools moved to the very top of national spending.

PDF of this Op-Ed available on Eric Hanushek's website, at: http://edpro.stanford.edu/hanushek/admin/pages/files/uploads/hanushek_0302.pdf .

Baker and Green explain the various mythologies embedded in this particular statement. See:

Green, P.C., Baker, B.D. (2006) Urban Legends, Desegregation and School Finance: Did Kansas City really prove that money doesn't matter? *Michigan Journal of Race and Law* 12 (1) 57-105

[64] Murnane, R. (1991) Interpreting the Evidence on Does Money Matter? Harvard Journal of Legislation. 28 p. 457-464

[65] Heather Rose and Julian R. Betts, "The Effect of High School Courses on Earnings," *Review of Economics and Statistics* 86, no. 2 (Month, 2004): 497–513, p. 510.

Adam Gamoran and Eileen C Hannigan, "Algebra for Everyone? Benefits of College-Preparatory Mathematics for Students With Diverse Abilities in Early Secondary School," *Educational Evaluation and Policy Analysis* 22, no. 3 (Fall, 2000): 241-254.

Mark C. Long, Patrice Iatarola, and Dylan Conger, "Explaining Gaps in Readiness for College-Level Math: The Role of High School Courses" *Education Finance and Policy* 4, no. 1 (Winter 2009): 1-33.

Leslie Killgore, "Merit and Competition in Selective College Admissions," *The Review of Higher Education* 32, no. 4 (Summer 2009): 469–488, p. 471.

[66] Bruce D. Baker, "Cheerleading, Ceramics and the Non-Productive Use of Educational Resources in High Need Districts: Really?" Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans, LA, 2011 http://schoolfinance101.files.wordpress.com/2010/01/b-baker-mo_il-resourcealloc-aera2011.pdf

[67] Taylor. C. (1998) Does Money Matter? An Empirical Study Introducing Resource Costs and Student Needs into Educational Production Function Analysis. In U.S. Department of Education. National Center for Education Statistics. *Developments in School Finance, 1997.*

NCES 98-212. Ed. Fowler, William J. Jr. Washington, D.C.: 1998. http://nces.ed.gov/pubs98/98212.pdf#page=83

[68] Wenglinsky, H. (1997) How Money Matters: The effect of school district spending on academic achievement. Sociology of Education 70 (3) 221-237

[69] Borman, G., Hewes, G. (2002) The Long Term Effects and Cost-Effectiveness of Success for All. Educational Evaluation and Policy Analysis. 24 (4) 243-266

[70] Fryer, R. (2011) Creating No Excuses Traditional Public Schools: Preliminary Evidence from an Experiment in Houston. Cambridge, MA: NBER Working Paper # 17494 http://www.nber.org/papers/w17494

[71] Hanushek, E.A. (1979) Empirical and Conceptual Issues in the Estimation of Educational Production Functions. Journal of Human Resources 14 (3) 351-388

[72] Baker, B.D. (2001) Can flexible non-linear modeling tell us anything new about educational productivity? *Economics of Education Review* 20 (1) 81-92.

Figlio, D. N. (1999). Functional form and the estimated effects of school resources. *Economics of Education Review*, *18* (2), 242–252.

[73] Baker, B.D. (2011) Exploring the Sensitivity of Education Costs to Racial Composition of Missouri School Districts. *Peabody Journal of Education* 86 (1) 58-83

Duncombe, W., Yinger, J. (2005) How Much more Does a Disadvantaged Student Cost? *Economics of Education Review* 24 (5) 513-532

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

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

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[74] These studies have some significant empirical advantages over production function studies in that they allow for corrections to be made for differences in the level of efficiency in producing outcomes across districts. This is possible in a cost function framework because the spending variable is the dependent variable rather than being one of the independent variables. When spending is the dependent variable, one can include in the model characteristics of school districts theoretically assumed to be related to greater inefficiency, such as less constrained fiscal capacity.

[75] See for example:

Borman, G.D., Hewes, G., Overman, L.T., Brown, S. (2003) Comprehensive School Reform and Achievement: A Meta-Analysis. Review of Educational Research 73 (2) 125-230

Borman, G., Hewes, G. (2002) The Long Term Effects and Cost-Effectiveness of Success for All. Educational Evaluation and Policy Analysis. 24 (4) 243-266