

**Middle School Operating Levies and 8th Grade Mathematics and Reading
Achievement: Evidence from Minnesota, 1998-2005***

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Evidence from Minnesota, 1998-2005**

ABSTRACT

Does the increased funding that an operating levy brings to a school district raise the academic achievement of students in that district? Extensive previous research has considered the connection between school funding and student achievement, but surprisingly little research has focused on the efficacy of this widely used policy mechanism for funding schools. We regress annual school-level measures of Minnesota 8th graders' reading and mathematics achievement between 1998 and 2005 on indicators of the level of support that those schools received from publicly approved operating levies over that period. Our models include measures of district-level funding provided via operating levies, school-level measures of 8th graders' math and reading achievement, and time-vary covariates indicting schools' resource allocation and their students' social, economic, and demographic characteristics. We estimate a series of school and year fixed effects models, with careful attention to the timing of resource availability.

Middle School Operating Levies and 8th Grade Mathematics and Reading Achievement: Evidence from Minnesota, 1998-2005

School and education funding is a critical issue in current research as well as politics. The debate over how schools should be funded is carried out among scholars, policy makers, on street corners and over dinner tables. One common facet of education funding is levies placed on local property taxes of homeowners. Since 1991, 89% of school districts in Minnesota have put operating levy school referenda to their voters. More than half of districts have asked their voters for multiple operating levies since 1991. Furthermore, referenda pass more often than they fail. Unfortunately, previous research on the connection between funding and student achievement outcomes has lacked one critical policy question: Do school referenda work? In other words, does the increased funding that an operating levy brings to a school district raise the academic achievement of students in that district? Extensive previous research has considered the connection between school funding and student achievement, but surprisingly little research has focused on the efficacy of this widely used policy mechanism for funding schools. In the analyses below, we regress annual school-level measures of Minnesota 8th graders' reading and mathematics achievement between 1998 and 2005 on indicators of the level of support that those schools received from publicly approved operating levies over that period.

REVIEW OF EXISTING LITERATURE

The literature on the relationship between schools' financial resources, the sources and purposes of those resources, the distribution of those resources across students, and academic achievement is vast (e.g. Alexander and Griffin, 1976; Behrman and Birdsall, 1983; Coleman, et al., 1966; Entwisle and Hayduk, 1988; Greenwald, et al., 1996; Hanushek, 1989; Heyneman and Loxley, 1983; Johnson and Stafford, 1973; Sorenson and Hallinan, 1977). Below we very

briefly summarize some of this enormous body of work, which we loosely divide into two camps: That which concludes that additional financial resources have the effect of improving academic achievement and that which concludes otherwise. Along the way, we highlight methodological issues and debates that are relevant for our own analyses.

Some argue that funding does not make much of a difference in student achievement outcomes. Notable examples include Coleman et al (1966), Towers (1992), Betts et al (2000), Clark (1998), Hanushek (1996, 1991, 1989, 1986), and Hedges et al (1994), and to varying degrees McPherson (1993), Clowes (2002), Skandera and Sousa (2002), and Picus (2000).

The ground-breaking Coleman Report of 1966 presented evidence that school funding was not the major factor in determining achievement outcomes. By the time his study was conducted, most heavily minority schools had achieved funding parity with their white counterparts. Instead, students' family background made the most difference in predicting their achievement. Racial minority students started at a level far behind white students at the outset of formal schooling and thus never caught up.

As more in the academic community considered that family and socioeconomic background might play a bigger role than school funding in academic achievement, methodology became more and more of a concern for researchers in critiquing one another's work. Hanushek (1996) showed that methodology was paramount in considering data on funding and achievement. Using the same data as Greenwald (1996), which showed a link between funding and achievement, Hanushek found no link at all.

Notable examples of those finding an achievement / funding link include Greenwald et al (1996), Harter (1999), Towers (1992), Betts et al (2000), and Clark (1998), and to varying degrees Wenglinsky (1997), Coleman (1986a,b), Cohen-Vogel (2001), Miller (2002), and

Jefferson (2005). With such a huge body of literature available on the funding / achievement link, Greenwald et al (1996) decided on a new approach to examining the problem. Rather than reexamining data or conducting a study similar to an older one, Greenwald conducted a meta-analysis of 60 other research studies and found that evidence existed to support the claim that there is a direct link between funding and achievement. The analysis found 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. This work provided the basis for several other publications, notably the aforementioned counter-paper by Hanushek (1996).

As work progressed, researchers considered multiple dimensions of the funding / achievement link. A good example of this diversification is Miller (2002:1), which found that “targeted resource allocation especially benefits disadvantaged children, that improving the classroom environment for current teachers may be more cost-effective and yield greater gains than just raising teacher salaries, and that family variables are among the strongest indicators of student achievement.” Coleman (1986a,b) had similar results in analyzing cross-school district funding differences.

Differences in researchers’ findings appear to depend on various methodological issues, as pointed out by Hanushek (1989, 1991, 1996), Hedges et al (1994), Jefferson (2005) and McPherson (1993). The level of analysis selected matters. Many studies focus on district-level effects, others on the school-level. District level studies tend to show effects (Greenwald et al 1996; Coleman 1986a,b; Cohen-Vogel 2001). However, such analyses can lose detail and variability among students, which is critical (Jefferson 2005; Hanushek 1996; McPherson 1993). Any student may have a bad day on test day, or school may have a particularly weak cohort of

pupils. Student level analyses from large samples can account for intra-district variability and help make up for the difference in funding allocation by individual schools. In New York City, for example, schools within individual districts receive vastly different funding (Kozol 2006). Some evidence suggests, however, that per-pupil-unit analyses are not robust (Skandera and Sousa 2002; Picus 2002).

The critical measure is isolating where money is going. For example, spending to reduce teacher-student ratios has a greater effect on student achievement than replacing ventilation equipment in a gymnasium (Miller 2002; Wenglinsky 1997). Adding to the mix is a consideration of the source of funds, as we show that operating levy school referenda are typically used specifically for improvement in instruction. Thus, targeted funding increases from referenda could conceivably have an achievement effect.

CRITIQUE OF PRIOR RESEARCH

Missing from prior research is consideration of both the source of funding as well as its allocation. It is not sufficient to simply regress student outcomes on an indicator of whether the school benefitted from the passage of a funding referendum. Many school referenda, such as building levies, are not explicitly for improvements in classroom instruction. In this sense, considering how dollars will be spent is critical to the analysis of the funding / achievement question. Only sources most related to classroom instruction should be considered.

Also missing is consideration of funding over time. After considering source and allocation together, several measures of the student body must be taken over time. While a point-measurement is an important part of the picture, it misses the point because a student who takes an exam whose school has only had extra funding for a year is logically unlikely to perform better than his/her counterparts did in the previous year. For example, a 2004

referendum would not affect test scores in 2004, but a 2004 referendum might affect test scores in 2008.

While some studies have considered both of the above individually, none that we could find considered the two in conjunction and applied it to a specific funding mechanism such as referenda.

CONTRIBUTION

The literature above provides several lessons as well as avenues for improvement. We will consider data on the smallest unit of analysis possible. The greatest attempt possible must be made to control for confounding variables that might affect the results. Inequality must be measured across AND within school districts and individual schools.

We will make use of school-house level funding and achievement outcomes, which allows for more variability among students, neighborhoods, and other intra-district variables. In doing so, we hope to achieve a greater level of validity and reliability than through broader school district level measures.

Focusing on exposures to funding over time also sets our work apart. While trajectories of achievement have been considered, a study analyzing different outcomes based on varying funding levels from a particular source has not.

By shedding light on an often publicized local policy lever that has little attention paid it among existing research, the public and policy makers will be better equipped to take on referenda-related issues. This seems all the more timely given how common referenda are in today's public education finance system.

DATA

In our analyses, we consider the relationships between district-level funding from operating levies and school-level measures of 8th grade math and reading achievement. Our sample consists of the 8,448 “school-years” created by cross-classifying each of 8 years between 1998 and 2005 by each of the 1,056 Minnesota schools enrolling 8th graders in those years. For each of these 8,448 observations we include measures of district-level funding provided via operating levies, school-level measures of 8th graders’ math and reading achievement, and time-vary covariates indicating schools’ resource allocation and their students’ social, economic, and demographic characteristics.

Our dependent variable is derived from the Minnesota Basic Standards Test (BST), which was administered to all students entering the 8th grade from 1996 until 2005 when it was phased out in favor of a new test. All students completed the test in the spring of their eighth grade year. The BST assesses basic mathematics and reading skills.

We will make use of the 1998 – 2005 test years. 1996 and 1997 are omitted due to scoring and implementation problems that occurred in those years. The data are at the school level, allowing for comparison both within and between school districts. The score reports include all first-time test takers and report the number passing and failing each particular section of the exam (reading and math). The mean scores of each section of the exam are also reported for each school. Included with the scores are demographic data on each school including race, class, gender, enrollment, and English language proficiency variables.

The second body of data in the analysis is the state Department of Education’s records on program spending by school districts over the 1998-1999 through 2004-2005 school years. This data set allows for district-level information on how much money was spent by the given district

in each of several program categories, ranging from salaries and benefits to building expenditures to program outlays such as special education spending.

Finally, the last body of data is a record compiled by the state Department of Education on all attempted referenda by school districts state-wide through the years of analysis. The data are restricted to operating referenda, which are the type used to bolster a given district’s general fund. In other words, this kind of referendum is used to hire more teachers and update classroom instructional materials. This is contrasted against building referenda, which are specifically for improving or building new infrastructure, and technology and other ‘targeted’ referenda, which are largely used to update computer labs and science/technology classrooms, although they can range from hiring a new school nurse to providing for security monitoring. These types of levies are not included in the data. The data include the district that attempted the referendum, whether it passed, the number voting in favor and against the referendum, the amount of the per pupil unit (PPU) funding increase, and the length in years the new tax levy will last (Minnesota has a statutory cap of 10 years, which requires districts to reauthorize referenda with the voters after the given levy expires).

RESEARCH DESIGN

We are interested in estimating the association between school referenda and 8th grade test scores in reading and mathematics—all of which vary across schools and over time. Separately for reading and math scores, we will employ state and year fixed effects models which can be written as:

$$Y_{it} = \alpha + \beta(Rreferenda)_{it} + \sum_1^n \lambda_n X_{mit} + \sum_1^{i-1} School_i + \sum_1^{t-1} Year_t + \varepsilon_{it} \quad (1)$$

where Y_{it} represents the outcome variable in school i in year t ; β expresses the association between the outcome and referenda resources that vary over the i schools and the j years; α is a constant; n indexes several time-varying covariates X (including socio-demographic characteristics and a variety

of school finance and expenditure measures); λ_n represents the coefficients for these n time-varying covariates; $School_i$ and $Year_t$ are school and year fixed effects, respectively, and ε_{it} is a random disturbance term. The school fixed effects in Equation 1 conceptually account for all aspects of school that remain constant over time but vary across states. The year fixed effects conceptually account for all aspects of years that are constant across states but vary over time. This technique is built on the recognition that it is impossible to explicitly measure all aspects of particular schools or of particular years that might bias our estimate of the association between referenda passage and our outcomes. To estimate the model in Equation 1 we use the least-squares dummy-variable approach, in which dummy variables are introduced for each of $i-1$ schools and for each of $t-1$ years.

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