Re-Examining a Primary Premise of Market Theory: An Analysis of NAEP Data on Achievement in Public and Private Schools

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ABSTRACT
This study examines the mathematics performance of students in public, Catholic, and other private schools. In view of widespread interest in private models for education organization, it is important to understand the impact of different school models on students' academic achievement. Drawing on a representative sample of 23,000 4th- and 8th-grade students in 1,340 public and private schools, this analysis confirms that private school students, on average, scored substantially higher than their public school counterparts. However, contrary to previous studies, this HLM analysis found that the performance of students in Catholic and other private schools actually falls significantly below that of public school students when accounting for SES, race, and disability status differences in the populations of these schools. At this time when market-style reforms are changing the public school landscape, this study offers fresh evidence that challenges common assumptions about the general superiority of private schools.

KEYWORDS: Private schools, Public Schools, Privatization, Achievement

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Introduction

Different organizational structures for public and private schools are commonly thought to lead to different levels of effectiveness. This belief serves as the primary premise for much of the logic underlying current reforms in U.S. education, especially those that employ structural or choice approaches to address issues of organizational effectiveness. Theorists have posited that factors such as more entrepreneurial models of leadership, consumer-driven accountability models, and competitive orientations emerge largely outside of the public sector, and better enable private and independent organizations to enhance student achievement. While some have rightly noted that private schools draw a different enrollment than do public schools, over the last quarter-century, research that controlled for student socioeconomic status (SES) and other background variables has affirmed a positive "private school effect" (Somers *et al.*, 2004, p. 48). The weight of these findings have supported the primary assumption underlying choice-based reform efforts such as charter schools and voucher plans in their implicit and explicit embrace of private school organizational and institutional models. Thus, common wisdom assumes, and scholarly opinion appears to confirm, that private schools do a better job of boosting achievement, and prominent researchers conclude that these schools narrow the achievement gap between different sub-groups of students (Lee & Bryk, 1989).

This study takes a fresh look at these assumptions using 2000 National Assessment of Educational Progress (NAEP) achievement data for mathematics. This subject is

particularly useful because mathematics achievement is generally thought to be influenced less by family background, and more by institutional effectiveness, than is student achievement in other content areas. In focusing on the mathematics performance of over 23,000 4th- and 8th-grade students in a nationally representative sample of 1,340 public and private schools, this analysis controls for SES, race, and disability status in order to better distinguish the organizational effects of different school types. Although, as expected, private school students on average scored substantially higher than their public school counterparts, when accounting for demographic differences between public and private school students, we found that public school students actually performed *significantly better* than Catholic and other private schools. The "equity effects" of private schools in narrowing the achievement gap between different groups were inconsistent.

This new analysis is timely for three reasons. First, much of the ground-breaking research in this area is quite dated, with most of the studies finding a private school effect based on a sample of high school students who began school in the late 1960s. Since that time, a number of major changes in the educational landscape suggest the need to re-examine this issue; the private school sector, for instance, has evolved in recent decades, with the expansion of non-Catholic religious schools, and the increase in non-Catholic students at parochial schools (Broughman & Pugh, 2004; McLaughlin & Broughman, 1997). Secondly, current reform efforts dominating the educational landscape — charter schools, tuition tax credits, and vouchers — are based largely on assumptions about the superiority of private organizational models, which the findings from this study

challenge. Thirdly, the most prominent federal education legislation in decades, the No Child Left Behind Act ("No child left behind act of 2001", 2002), explicitly requires that public schools raise achievement — particularly for the lowest performing groups. Public schools that fail in this regard are sanctioned with remedies intended to improve their organizational effectiveness, including consumer-style choice, charter status, and other aspects drawn from the private sector model. Using strong and comprehensive demographic measures of student background characteristics, and a larger data set, this study re-examines achievement differences by school sector, giving particular attention to elementary grades in public, Catholic, and other private schools.

Research Context

A half a century ago, theorists and reformers began to note the potential benefits of structural reforms that referred to the private sector as a way of improving educational processes and, therefore, academic outcomes in schools (Blum, 1958; Friedman, 1955). Central to this emerging perspective was the insight that a school's organizational structure and institutional environment shape its internal processes. For instance, as input-driven organizations accountable to internal standards, public schools have little incentive to demonstrate superior outcomes to an external authority such as consumers, so organizational innovation and effectiveness are thought to be weaker than in private organizations (Coleman, 1997). According to this view, without external standards or a consumer-orientation, organizations are not predisposed toward being responsive to their clients — a particularly troubling implication for disadvantaged students or learners who do not respond well to standard methods (Chubb & Moe, 1990; Peterson, 1990). Thus, in

light of the problems inherent in publicly administered education, and the need for diversity of approaches, some proposed that students be allowed to take their government funding to the more effective private school sector, or at least that the organizational attributes that make private schools more effective be applied as much as possible within public education (see, e.g., Coleman, 1966; Coons & Sugarman, 1978; Jencks, 1972).

At the time that Milton Friedman first floated his proposal in a theoretical essay for choice between public and private schools, the predominant thinking on differences in school success focused on the individual student in terms of his or her intelligence or economic background (Connell *et al.*, 1982). While subsequent perspectives emphasized the role of culture in explaining differences in school outcomes (Valencia, 1997; e.g., Kaplan, 1963), they have since been criticized for minimizing the role of institutional effects on student achievement (Lemann, 1999; Rothstein, 2004). Thus, more recent reforms such as school choice and the No Child Left Behind Act of 2001 ("No child left behind act of 2001", 2002) are premised on the assumptions that (1) organizational effectiveness can have a substantial, or even primary, impact on student achievement, and (2) that impact on student achievement is informed by the governance structures, internal organization, and institutional environments of different types of schools.

Following the Coleman report, prominent researchers and reformers concerned with diversifying enrollments and equalizing opportunities called for greater diversity in the educational treatments available to disadvantaged groups (Coleman, 1966; Coons & Sugarman, 1978; Jencks, 1972). While the earliest experiment with choice — the famous

Alum Rock study — was intended to test the potential for choice that progressive reformers had suggested, conclusions regarding the institutional effects of different organizations were obscured by the fact that parents tended to choose schools based on issues such as proximity, rather than effectiveness (Bridge & Blackman, 1978). Later research greatly expanded the scale of such studies, and attempted to control for students' background characteristics in assessing school effectiveness. Using different methodologies and assumptions, several research efforts using the High School and Beyond (HSB) dataset found private schools performed better in raising achievement, even after controlling for student SES in the form of family income (Bryk *et al.*, 1993; Chubb & Moe, 1990; Coleman *et al.*, 1982; Haertel *et al.*, 1987; Lee & Bryk, 1989). Some of the more nuanced work on the HSB dataset found that Catholic schools were more effective than public schools at narrowing the achievement gap between ethnic groups (Bryk et al., 1993). (Similarly, some research on choice has shown benefits to private schooling for some groups, but not others (Howell & Peterson, 2002).)

Researchers explained this "private school effect" in terms of organizational variables that made private schools predisposed toward effectiveness and efficiency. Coleman and associates understood this pattern as the "common school effect," whereby like-minded communities shared values and educational goals for their schools (Coleman & Hoffer, 1987; Coleman et al., 1982). Bryk and colleagues (Bryk et al., 1993; Lee & Bryk, 1989) reported similar findings, suggesting that Catholic schools in the study did a better job than public schools in increasing mathematics achievement because they emphasize community values. Using the same data, Chubb and Moe (1990) also found advantages

for private schools, connecting this finding to the school effectiveness literature, which emphasized the homogeneity of school communities in reducing conflict (Edmonds, 1979). But they went further and argued that specific organizational factors, such as leadership, autonomy, and client-orientation, allowed private schools to be more effective.

More recent research on voucher programs also speaks to the issue of public and private school achievement. Voucher programs in Milwaukee, Cleveland, New York, Dayton, and the District of Columbia provide the opportunity to attend private schools for students who may not otherwise not be able to afford tuition, thereby allowing researchers to study private school effects. Early research on the Milwaukee program found little or no private school advantage when controlling for student background characteristics (Witte, 2000; Witte *et al.*, 1995). Secondary analyses, however, found that private schools boosted the achievement of students compared to their former peers in public schools, although this research has been contested on methodological grounds (J. Greene *et al.*, 1996; J. P. Greene *et al.*, 1998; Peterson, 1995). Similar competing findings and debates emerged around the publicly funded program in Cleveland (J. P. Greene *et al.*, 1997; Metcalf *et al.*, 2003). The privately funded programs in New York, Dayton, and Washington, DC offered researchers the opportunity to undertake a randomized field trial, where family choices would not confound attempts to separate family and institutional effects (Howell *et al.*, 2000; Mayer *et al.*, 2002; Myers *et al.*, 2000). Applicant pools were randomly divided between those who were selected to receive a voucher to attend a private school, and those who were not. The findings

suggested that private schools accelerated student achievement for *some* students, although those conclusions have also been challenged (Howell & Peterson, 2004; Krueger & Zhu, 2004a, 2004b; Peterson & Howell, 2003, 2004). Nevertheless, the public tends to accept the notion that, all things being equal, private schools are preferable (Moe, 2001).

Theoretical Framework

In light of serious concerns about the chronically low achievement of disadvantaged students relative to other groups (Howell & Peterson, 2002; Jencks & Phillips, 1998; S. T. Lubienski, 2002; Rothstein, 2004), this analysis both builds upon, and challenges, the rich research literature on school organization and achievement. In general, past studies have found a positive private school effect in promoting student achievement and equity. While there have been different explanations offered for the positive private school effects, the most prominent thinking in current reform efforts, Public Choice theory — also referred to as "market theory" in education — attributes the inferior performance of public schools to the organizational structures and consequent behaviors of publicly administered organizations (Smith, 2003; e.g., Walberg, 2000; e.g., Walberg & Bast, 2001). Using economic assumptions in analyzing the public sector, this perspective prescribes private-style institutional attributes and arrangements such as competition, consumer choice, market-style accountability, and entrepreneurial management as keys to institutional effectiveness. This perspective has, to a great degree, shaped current thinking on school reform, where policies encourage the use of the exit option so that families may leave public schools for more effective alternatives (Hirschman, 1970).

This thinking undergirds the arguments for vouchers and — to the extent that they are intended to reflect attributes of private organizations — charter schools (C. Lubienski, 2003; Somers et al., 2004).

This analysis comparing public and private school achievement grew out of a larger study of mathematics instruction, achievement and equity. While analyzing the relationship between particular instructional practices and students' mathematics achievement, we were intrigued by an unexpected occurrence: when controlling for private school status and student background variables in our statistical models, we saw that mathematics achievement in public schools actually appeared higher than in private schools.[i] We undertook a special sub-study focusing specifically on achievement differences in public and private schools. Using a powerful SES variable created for the broader study, we were able to more carefully examine the question of whether the widely assumed "private school effect" is a reflection of the superior institutional effectiveness of private schools, or if it may be due to the fact that private schools draw a different population of students than do public schools. The study focused solely on student achievement in mathematics – a subject generally thought to be less influenced by family background, and more by institutional effects than other school subjects such as history or literacy.

Research Questions

Limitations of previous studies on school sector effects include the lack of accounting for students with disabilities, and failure to distinguish between Black and Hispanic students, as well as between Catholic and other forms of private schools.[ii] Moreover, foundational

studies on private school effects are becoming dated and have been limited to high school (as is a more recent study, Kim & Placier, 2004). With those issues in mind, this analysis examines the following questions:

1) Are 4th and 8th-grade mathematics achievement means higher or lower in public, Catholic, or other private schools?
2) Does the private school advantage (if any exists) persist even after controlling for SES, race, and student disability status?
3) Are SES-, race- or disability-related achievement gaps significantly wider or narrower in Catholic or other private schools than in public schools?

Method: Data Source and Analysis

NAEP is an important tool for monitoring student achievement. It is the only nationally representative, ongoing assessment of U.S. academic achievement, measuring student performance at 4th, 8th, and 12th grades in mathematics and other subject areas.[iii] Since 1990, the Main NAEP mathematics assessment has been guided by a framework based on the National Council of Teachers of Mathematics' *Curriculum and Evaluation Standards for School Mathematics* (1989). Hence, the Main NAEP assesses students' performance on both multiple choice and constructed-response items over the five mathematics strands emphasized by NCTM: number/operations, geometry, measurement, data analysis, and algebra/functions.

This study utilized 4th and 8th grade data because these grades were the focus of the original study on instruction and achievement (teacher-reported instruction-related data are available for these grades only). The focus on students in the earlier grades reduces the potential for differential dropout rates in public and private schools to bias the results,

and also reduces the likelihood that the students in the sample had transferred between public and private schools, thereby confounding efforts to distinguish sector effects.

NAEP Samples.

We analyzed achievement and survey data from the 2000 Main NAEP mathematics assessment from a restricted-use CD ROM.[iv] Unweighted samples sizes by school type are shown in Table 1.

Missing data minimally impacted samples, with sample sizes for the HLM analyses containing 13,419 (out of 13,511) students across 739 (out of 742) schools at grade 4, and 14,780 (out of 15,658) students across 737 schools (out of 740) at grade 8. The demographics for the slightly reduced samples were similar to the demographics of the entire data set.

Variables.

In addition to binary variables for "Catholic" and "Other Private" schools, several demographic variables were utilized in this analysis. Binary variables were created for "Black" and "Hispanic" students, as well as for "Students with Disabilities." A school race variable was created by conducting a logarithmic transformation of the percent of White/Asian students sampled from each school.

We used a more comprehensive SES variable than the single variable, free/reduced lunch, that is often employed. We began by creating a student-level SES variable. For grade 4, we combined the following six SES-related variables into one student-level SES variable:

- Reading material in students' homes (newspapers, magazines, books, and encyclopedia)[v]
- Computer access at home
- Internet access at home
- Extent to which a student's studies are discussed at home
- School lunch eligibility
- Title 1 eligibility

With the exception of school lunch and Title 1 eligibility, which were taken from school records, this information was self-reported by students.

Table 1: Sample Sizes, Mean Achievement and Demographics by School Type

	Public	Private (Non-Catholic)	Catholic
Grade 4	*n=7070 students 385 schools*	*n=3672 students 222 schools*	*n=2769 students 135 schools*
Mean Achievement (standard error in parentheses)	226 (1.2)	239 (1.2)	238 (1.1)
Percent black	15	8	6
Percent Hispanic	16	7	11
Average student SES (Standard deviation from mean)	-.08	.66	.68
Pct Students with Disabilities	5.8	1.2	1.4
Grade 8	n=9353 students *383 schools*	n=3436 students *208 schools*	n=2869 students *149 schools*
Mean Achievement (standard error in parentheses)	274 (1.0)	290 (1.5)	284 (1.7)
Percent black	14	9	8
Percent Hispanic	15	6	11
Average student SES (Standard deviation from mean)	-.07	.73	.61
Pct Students with Disabilities	5.4	2.3	2.0

Note: Sample sizes are the unweighted NAEP reporting samples, however the achievement means and the percentages are for the samples that are weighted to represent U.S. students and schools. Private schools are over-sampled during NAEP data collection to help produce more reliable estimates.

At grade 8, we combined the above six variables with two additional variables: "mother's education level" and "father's education level," as reported by students.[vi] Using factor analysis, we combined the set of SES-related variables into a single SES variable for both 4th and 8th grades.[vii] We then had a stronger, continuous variable that was more sensitive to SES differences than school lunch alone.

A school-level SES variable was created using a combination of the student-level SES composite and two school-reported variables: the percentage of students in the school qualifying for Title 1 funds and free/reduced lunch. These two variables were not continuous but instead contained percentage-range categories (e.g., 1-5%, 6-10%, 11-25% etc.). To create as strong a school SES variable as possible, we created a weighted average of these two school-reported variables with the richer SES information available regarding the students sampled from each school.[viii]

Data Analysis.

Means and standard errors for mathematics achievement by school type (as shown in Table 1) were computed using AM Statistical Software, which was designed by the American Institutes for Research to handle the weighting and jackknifing needs of complex data sets such as NAEP.[ix] Because of the nested nature of the data (students within schools), Hierarchical Linear Models (HLM) were used to examine achievement by sector while controlling for potential confounding variables, including SES, race, and disability status. The HLM software can accommodate multi-level datasets such as NAEP (Raudenbush & Bryk, 2002) and is capable of addressing the special needs of NAEP analyses (e.g., plausible values and weighting issues).

In the HLM models, students (level 1) were nested within schools (level 2). After running a base model, and then a model with demographic variables, school sector variables were added to the final model to determine the coefficients for Catholic and other private schools while controlling for demographic differences among school types. Interactions between school type and race-, SES- and disability-related achievement disparities were also included to determine if the disparities were larger or smaller in public, Catholic, or other private schools.[x]

In all of the analyses, the appropriate weights and plausible values were utilized as appropriate for NAEP data. Further details about the creation of composite variables and the larger study's methodology and findings are explained in a report submitted to NCES.[xi]

Results

To help the reader interpret the results discussed here, some information about NAEP scores is necessary. NAEP uses a 500-point scale on which 4th graders scored an average of 228, 8th graders scored 275 and 12th graders scored 301 in 2000. The standard deviation for these scores was 31 points at grade 4 and 38 points at grade 8. Hence, a difference of 3-4 points can be considered an effect size of roughly 0.1.

At both 4th and 8th grades, the mean achievement for public school students was significantly lower than that of Private and Catholic school students, with differences

ranging from 12 to 16 points, or one quarter to almost one half of a standard deviation (see Table 1). However, the percentage of Black, Hispanic, lower-SES students, and students with disabilities was much higher in public schools than in private schools. This raises the question of whether the private/Catholic school advantage is due simply to its relatively advantaged student body, or if the differences would persist after controlling for demographic differences.

Grade 4 HLM Models.

Table 2 presents the grade 4 HLM models that examined school sector, demographic variables, and their effects on mathematics achievement. Model 0 indicates that the mean mathematics achievement for the students in the HLM sample averaged 14.3 points higher in Catholic schools and 17.9 points higher in other private schools than in public schools, where the mean was 222.6.[xii]

Model 1, the traditional base model, indicates that the average mathematics achievement for all students in the HLM sample was 228.6. Model 2 indicates that even after controlling for SES utilizing a powerful student-SES variable, there were still large, highly significant race-related gaps within schools. Specifically, within schools, black students scored an average of 17 points lower than White students of similar SES, while Hispanic students scored 13 points lower than their White peers.[xiii] The Model 2 coefficients also indicate that a student with SES one standard deviation above the mean scored an average of 8 points higher than a fellow student of average SES. Hence, a student near the top of the SES distribution (two standard deviations above the mean)

scored roughly 32 points higher than a student near the bottom of the SES distribution, or a gap of one full standard deviation in achievement. Model 2 also shows that students

Table 2: Estimated Effects of School Sector and Demographic Variables on 4th Grade Mathematics Achievement

4th grade	Model 0 Private Schools Only	Model 1 Base Model	Model 2 Add SES, Race & Disability	Model 3 Add Private School & Interactions
Fixed Effects	*Coefficient*			*Coefficient*
Intercept	222.6***	228.6***	236.2***	237.8***
Sch SES			4.2***	5.5***
Sch Race			1.4*	1.3
Catholic School	**14.3*** **			**-4.2****
Other Private School	**17.9*** **			**-2.7**
Black Gap			-17.0***	-16.8***
Catholic School				-.2
Other Private School				-2.5
Hispanic Gap			-13.0***	-13.0***
Catholic School				1.3
Other Private School				2.1
Student SES Differentiation			8.0***	8.2***
Catholic School				**-2.6****
Other Private School				**-2.0***
Disability Gap			-29.1***	-29.3***
Catholic School				5.4
Other Private School				5.1
Random Effects	*Variance Component*	*Variance Component*	*Variance Component*	*Variance Component*
Intercept (variance between schools)	250.6***	297.5	83.7***	82.7***
Level-1 (variance within schools)	665.0	666.6	553.2	552.8

* p<.05 ** p<.01 *** p<.001

with disabilities, on average, scored 29.1 points lower than their non-disabled peers. The coefficient for school race was a barely significant 1.4 points, but that for school SES was a significant 4.2 points. The reduction in variance components from Model 1 to Model 2 indicate that the demographic/disability variables added to Model 2 explain 34% of the overall variance in achievement, accounting for 72% of the variance between schools, and 17% of the variance within schools.

As Model 3 reveals, after accounting for differences in SES, race, and disability, the coefficients for Catholic and other private schools are actually negative: –4.2 points for Catholic schools and –2.7 points for other private schools. Hence, the private school advantage evident in model 0 can be explained by the higher proportions of high-SES White students and relatively few students with disabilities attending private schools. In other words, the demographic differences between schools more than account for the achievement differences originally favoring private schools. In fact, Catholic school fourth graders scored significantly lower than those in public schools once race, SES and disability were controlled.

The interaction terms in Model 3 indicate that the 16.8-point Black-White disparity would be increased by an insignificant .2 points in Catholic schools and 2.5 points in other private schools. Similarly, there was no significant relationship between school sector and the within-school disparity for Hispanic students. However, there was a significant SES interaction for Catholic and other private schools, indicating that achievement differentiation by SES is significantly greater within public schools.

Specifically, the mean achievement differential corresponding with a gap of one standard deviation in SES was 8.2 points in public schools, but only 5.6 points in Catholic schools and 6.2 points in other private schools. Although the 29.3-point disability gap appeared to be substantially smaller in Catholic and other private schools, their coefficients of 5.4 and 5.1 points, respectively, were not significant (due to the large variation in scores of students with disabilities). Finally, the change in variance was fairly trivial upon moving from Model 2 to Model 3, indicating that adding the school sector variables to Model 2 did little to explain variation in student achievement.

Grade 8 HLM Models.

Similar HLM models were created for 8th grade, as presented in Table 3. Model 0 indicates that the mean mathematics achievement in the HLM sample averaged 12.4 points higher in Catholic schools and 18.8 points higher in other private schools than in public schools. Model 1, the traditional base model, simply shows that overall mean achievement was 277.2 points.

Model 2 includes student- and school-level SES and race, as well as student disability. As in grade 4, we can see that even after controlling for SES and disability, there are still large, highly significant race-related gaps within schools. Specifically, on average, black students scored 23.1 points lower than their White peers of similar SES, while Hispanic students scored 15.5 points lower. Model 2 also reveals that a student with SES one standard deviation above the mean scored an average of 10.4 points higher than a fellow student of average SES. Hence, a student near the top of the SES distribution (two

Table 3: Estimated Effects of School Sector and Demographic Variables on 8th Grade Mathematics Achievement

8th grade	Model 0 Private Schools Only	Model 1 Base Model	Model 2 Add SES, Race & Disability	Model 3 Add Private School & Interactions
Fixed Effects	*Coefficient*	*Coefficient*	*Coefficient*	*Coefficient*
Intercept – School Mean Achievement	271.8***	277.2***	285.9***	287.7***
Sch SES			3.2***	4.6***
Sch Race			1.0	.8
Catholic School	**12.4*** **			**-6.5*** **
Other Private School	**18.8*** **			**-3.7***
Black Gap			-23.1***	-23.0***
Catholic School				.4
Other Private School				-.7
Hispanic Gap			-15.5***	-15.8***
Catholic School				7.2**
Other Private School				3.7
Student SES Differentiation			10.4***	10.5***
Catholic School				-2.1
Other Private School				-.3
Disability Gap			-34.1***	-34.4***
Catholic School				10.6
Other Private School				.7
Random Effects	*Variance Components*	*Variance Components*	*Variance Components*	*Variance Components*
Intercept (variance between schools)	281.0***	324.8***	73.1***	70.9***
Level-1 (variance within schools)	966.3	967.8	786.3	785.8

* p<.05 ** p<.01 *** p<.001

standard deviations above the mean) scored over 40 points higher (more than a full standard deviation) than a student near the bottom of the SES distribution. Additionally, Model 2 indicates that students with disabilities, on average, scored 34.1 points lower than their non-disabled peers. The coefficient for school race was not significant, but the coefficient for school SES was a significant 3.2 points. The reduction in variance components from Model 1 to Model 2 indicate that the demographic/disability variables added to Model 2 explain 34% of the overall variance in achievement, accounting for 77% of the variance between schools, and 19% of the variance within schools.

Again, once we control for demographic variables, the school sector gaps are reversed (even more dramatically than at grade 4), with public school students significantly outscoring Catholic school students by an average of 6.5 points and other private school students by 3.7 points. Hence, as with 4th grade, the apparent private school advantage suggested in Model 0 is attributable to the lower proportions of high-SES, minority, and disabled students attending private schools.

According to Model 3, the achievement disadvantage for Black and for low-SES students was not significantly different in Catholic or Private schools than in Public schools. However, the Hispanic-White gap for eighth graders was significantly less in Catholic schools. Specifically, in public schools, Hispanic students scored an average of 15.8 points lower than their White peers, but this gap was 7.2 points less, or only 8.6 points in Catholic schools. As in grade 4, although the Disability gap reduction for Catholic schools appears large at 10.6 points, it is not significant.

Finally, the change in variance was again very small when moving from Model 2 to Model 3, indicating that adding the school sector variables to Model 2 explained less than 1% of the variation in student achievement.

Discussion

The results for fourth- and eighth-grade consistently indicate that demographic differences between public and private schools more than account for the relatively high achievement of private schools. In fact, although this study included SES, race, and disability, additional analyses showed that SES alone accounts for most of the achievement differences accounted for in this study. Specifically, we found that public schools within each school SES quartile scored equal or higher than corresponding private schools (Lubienski & Lubienski, in press).

This nationally representative picture of achievement in American schools actually suggests that, in some ways, public schools may be doing a relatively good job compared to private schools once we account for differences in student populations. Still, consistent with what Lee and Bryk (1989) found, there were some ways in which outcomes appeared more equitable within private schools. In particular, SES-related achievement gaps were smaller in Catholic and other Private schools at grade 4, and the achievement disadvantage for Hispanic students was smaller in Catholic schools at grade 8. Still, these correlations must be interpreted carefully, due to limitations of this study.

Limitations

The representative nature of the NAEP samples and the consistency of the correlations between school type and student achievement at grades 4 and 8 lend support for the reliability of this analysis. However, any analysis of NAEP has limits. The most important limitation of these data lies in the fact that the NAEP is cross-sectional, not longitudinal. Hence, NAEP data do not allow for examinations of growth in achievement over time, nor do they include information about student movement between school sectors. Therefore, correlations between school sector and achievement are not demonstrably causal. In other words, one cannot conclude from this analysis that public schools are more effective at promoting student growth than private schools. Similarly, we cannot conclude that private schools are more effective at narrowing achievement gaps. It could be, instead, that private schools tend to attract students with a narrower range of prior achievement.

In view of these limitations of the data, this study does not conclude that public schools are necessarily more *effective* than private schools; however, it does seriously challenge the common assumption that private schools are more effective at promoting overall student achievement than are public schools.

Conclusions

At this time when market-style reforms are changing the public school landscape, prompting many to call for various forms of privatization of schooling options, this study takes a fresh look at the common assumption that private schools are more effective than public schools. The results of this comprehensive, large-scale study indicate that once we

account for the fact that private schools draw a more selective student intake with background attributes associated with academic success, public school students significantly outperform both Catholic and other private school students.

Still, the fact that SES-related disparities were smaller for fourth graders in Catholic and other private schools, and that Hispanic-White disparities were smaller for eighth-graders in Catholic schools should not be overlooked. Although this study challenges claims regarding greater overall effectiveness of private schools, it remains possible that there are some relatively beneficial aspects of private schools in terms of the promotion of equity. However, arguments promoting market-style reforms based upon assumptions and claims about the general superiority of private schools need to be re-considered in light of the evidence this study provides.

Future directions should include examinations of twelfth-grade data to determine whether the patterns identified here persist in high school. Additionally, with NAEP's increased sample sizes in 2003 and beyond, it will be possible to include attention to additional ethnic groups in future analyses, and to look more closely at particular types of private and public schools, including charter schools. The use of longitudinal data would enable researchers to make claims about the institutional effects of public and private schools. Additionally, the inclusion of additional variables would help determine whether particular school- and instruction-related differences account for the school sector gaps that were found in this study. For example, if differences in the employment of certified

mathematics teachers explains part of the achievement disparity between pubic and private schools, this would suggest an avenue for improving effectiveness in all schools.

NOTES

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[ii] Private schools in the U.S. are typically divided into Catholic, other religious, and non-religious categories (e.g., Broughman & Pugh, 2004).

[iii] Two different NAEP assessments are administered to a nationally representative subset of students: the Long-Term Trend NAEP and the Main NAEP. The Long-Term Trend assessment was created in 1973 and has remained constant over time. In contrast, the Main NAEP is responsive to national curricular trends and currently assesses students' performance on both multiple choice and open-ended questions over the five mathematics strands emphasized by the National Council of Teachers of Mathematics: number/operations, geometry, measurement, data analysis, and algebra/functions. There is also a third NAEP assessment, "State NAEP", which is administered to samples from each participating state.

[iv] At this time, the 2000 assessment is the most recent for which raw data are available to researchers. Consistent with the NAEP reporting samples for 2000, the samples utilized were those for which accommodations for students with special needs were not permitted.

[v] Students report whether they have each of these items, and the NAEP dataset combines the four responses into a single variable.

[vi] Because many 4th graders have limited knowledge of their parents' schooling, NAEP no longer asks 4th graders about their parents' education.

[vii] At each grade level, the factor analysis produced two factors with eigenvalues greater than 1, with one factor generally loading more heavily on Title 1 and lunch eligibility, and the other loading more heavily on the remaining home environment variables. The factors were saved as variables using the Anderson-Rubin method, which results in a composite Z-score with mean zero and standard deviation one. Given that the goal was to distill a single SES variable, a weighted average of the two factors was constructed using the eigenvalues as weights. (For example, at grade 4, factor 1 had an eigenvalue of 1.9 and factor 2 had an eigenvalue of 1.1. These factors were combined using the equation: New Variable = 1.9/3 * factor 1 + 1.1/3 * factor 2.)

[viii] Given that schools can vary in their definitions of who is and is not eligible for Title 1, we considered lunch eligibility more reliable than Title 1 as a measure of school SES. We therefore counted lunch eligibility three times as heavily as Title 1 eligibility in

creating a weighted average of the two school-reported variables. This Lunch/Title1 composite was then combined with the student-level SES variable. However, we needed to account for the fact that if only a few students were sampled from a school, the student SES information would be a less reliable measure of school SES than the school-reported variables. On the other hand, if the sample from a school is larger, the student SES information would be richer and more reliable. Thus the final school SES variable was created as a weighted average of student-level SES and the percentage of students eligible for free/reduced lunch and Title 1, with the student-level SES being weighted more for those schools with larger samples and less for those schools with smaller samples.

[ix] Complexities of NAEP's design are discussed in detail in Johnson, 1992; and Johnson & Rust, 1992.

[x] Predictor variables that were continuous were centered around their overall mean, whereas binary predictors were not centered.

[xi] The technical report for this analysis, entitled "Reform-Oriented Mathematics Instruction, Achievement, and Equity: Examinations of Race and SES in 2000 Main NAEP Data," has been submitted to the NCES. Readers may contact stl@uiuc.edu for copies.

[xii] The label "Model 0" is used instead of "Model 1" to indicate that this model containing only school sector variables is not the traditional base model, but is instead a rather unorthodox HLM model that contains no student-level variables. However, this model is useful for confirming the private school advantage that is apparent when no demographic variables are included.

[xiii] For the sake of simplicity for the reader, the term "White students" is being used to indicate the group of non-Black and non-Hispanic students—a group that consists of over 90% White, non-Hispanic students. (The weighted fourth-grade NAEP samples less than 4% Asian and less than 2% American Indian students).

REFERENCES

Blum, V. C. (1958). *Freedom of choice in education*. Glen Rock, NJ: Paulist Press.

Bridge, R. G., & Blackman, J. (1978). *A study of alternatives in American education: Family choice in schooling* (Vol. IV). Santa Monica, CA: Rand.

Broughman, S. P., & Pugh, K. W. (2004). *Characteristics of private schools in the united states: Results from the 2001-2002 private school universe survey* (No. NCES 2005-305). Washington, D.C.: National Center for Education Statistics, U.S. Department of Education.

Bryk, A. S., Lee, V. E., & Holland, P. B. (1993). *Catholic schools and the common good*. Cambridge, MA: Harvard University Press.

Chubb, J. E., & Moe, T. M. (1990). *Politics, markets, and America's schools*. Washington, D.C.: Brookings Institution.

Coleman, J. S. (1966). Equal schools or equal students? *The Public Interest, 4*, 70-75.

Coleman, J. S. (1997). The design of schools as output-driven organizations. In R. Shapira & P. W. Cookson (Eds.), *Autonomy and choice in context: An international perspective* (pp. 249-270). Oxford, UK: Pergamon.

Coleman, J. S., & Hoffer, T. (1987). *Public and private high schools: The impact of communities*. New York: Basic Books.

Coleman, J. S., Hoffer, T., & Kilgore, S. (1982). *High school achievement: Public, Catholic, and private schools compared*. New York: Basic Books.

Connell, R. W., Ashenden, D. J., Kessler, S., & Dowsett, G. W. (1982). *Making the difference: Schools, families, and social division*. Sydney; Boston: Allen & Unwin.

Coons, J. E., & Sugarman, S. D. (1978). *Education by choice: The case for family control*. Berkeley: University of California Press.

Edmonds, R. (1979). Effective schools for the urban poor. *Educational Leadership, 37*(1), 5-24.

Friedman, M. (1955). The role of government in education. In R. A. Solo (Ed.), *Economics and the public interest* (pp. 127-134). New Brunswick, NJ: Rutgers University Press.

Greene, J., Peterson, P., & Du, J. (1996). The effectiveness of school choice in Milwaukee: A secondary analysis of data from the program's evaluation (Occasional Papers): Program on Education Policy and Governance, Harvard University.

Greene, J. P., Howell, W. G., & Peterson, P. E. (1997). An evaluation of the Cleveland Scholarship Program (Occasional Papers): Program on Education Policy and Governance, Harvard University.

Greene, J. P., Peterson, P. E., & Du, J. (1998). School choice in Milwaukee: A randomized experiment. In P. E. Peterson & B. C. Hassel (Eds.), *Learning from school choice* (pp. 335-356). Washington, DC: Brookings Institution Press.

Haertel, E., James, T., & Levin, H. M. (Eds.). (1987). *Comparing public and private schools: School achievement* (Vol. 2). New York: Falmer Press.

Hirschman, A. O. (1970). *Exit, voice, and loyalty: Responses to decline in firms, organizations, and states*. Cambridge, MA: Harvard University Press.

Howell, W. G., & Peterson, P. E. (2002). *The education gap: Vouchers and urban schools*. Washington, DC: Brookings Institution Press.

Howell, W. G., & Peterson, P. E. (2004). Uses of theory in randomized field trials: Lessons from school voucher research on disaggregation, missing data, and the generalization of findings. *American Behavioral Scientist, 47*(5), 634-657.

Howell, W. G., Wolf, P. J., Peterson, P. E., & Campbell, D. E. (2000). Test-score effects of school vouchers in Dayton, Ohio, New York City, and Washington, D.C.: Evidence from randomized field trials. Cambridge, MA: Harvard Program on Education Policy and Governance.

Jencks, C. (1972). *Inequality: A reassessment of the effect of family and schooling in America*. New York: Basic Books.

Jencks, C., & Phillips, M. (Eds.). (1998). *The black-white test score gap*. Washington, DC: Brookings Institution Press.

Johnson, E. G. (1992). The design of the National Assessment of Educational Progress. *Journal of Educational Measurement, 29*(2) 95-110.

Johnson, E. G. & Rust, K. F. (1992). Population inferences and variance estimation for NAEP data. *Journal of Educational Statistics*, *17*(2) 175-190.

Kaplan, B. A. (1963, November). Issues in educating the culturally disadvantaged. *Phi Delta Kappan,* 70-75.

Kim, M. M., & Placier, M. (2004). Comparison of academic development in Catholic versus non-Catholic private secondary schools. *Education Policy Analysis Archives, 12*(5), Retrieved on June 24, 2004 from http://epaa.asu.edu/epaa/v2012n2005/.

Krueger, A. B., & Zhu, P. (2004a). Another look at the New York City school voucher experiment. *American Behavioral Scientist, 47*(5), 658-698.

Krueger, A. B., & Zhu, P. (2004b). Inefficiency, subsample selection bias, and nonrobustness: A response to Paul E. Peterson and William G. Howell. *American Behavioral Scientist, 47*(5), 718-728.

Lee, V. E., & Bryk, A. S. (1989). A multilevel model of the social distribution of high school achievement. *Sociology of Education, 62*(3), 172-192.

Lemann, N. (1999). *The big test: The secret history of the American meritocracy*. New York: Farrar Straus and Giroux.

Lubienski, C. (2003). Innovation in education markets: Theory and evidence on the impact of competition and choice in charter schools. *American Educational Research Journal, 40*(2), 395-443.

Lubienski, S., & Lubienski, C. (in press). A new look at public and private schools: Student background and mathematics achievement. *Phi Delta Kappan*.

Lubienski, S. T. (2002). A closer look at black-white mathematics gaps: Intersections of race and SES in NAEP achievement and instructional practices data. *Journal of Negro Education, 71*(4), 269-287.

Mayer, D. P., Peterson, P. E., Myers, D. E., Tuttle, C. C., & William, H. G. (2002). *School choice in New York City after three years: An evaluation of the School Choice Scholarships Program* (Final Report). Princeton, NJ: Mathematica Policy Research Inc.

McLaughlin, D. H., & Broughman, S. (1997). *Private schools in the United States: A statistical profile, 1993-1994* (No. 97-459). Washington, D.C.: National Center for Education Statistics.

Metcalf, K., West, S. D., Legan, N. A., Paul, K. M., & Boone, W. J. (2003). *Evaluation of the Cleveland Scholarship and Tutoring Program: Summary report 1998-2002*. Bloomington, IN: Indiana University.

Moe, T. M. (2001). *Schools, vouchers, and the American public*. Washington, DC: Brookings Institution Press.

Myers, D. E., Peterson, P., Mayer, D., Chou, J., & Howell, W. G. (2000). *School choice in New York City after two years: An evaluation of the School Choice Scholarships Program* (No. 8404-036): Mathematica Policy Research Inc.

National Council of Teachers of Mathematics. Commission on Standards for School Mathematics. (1989). *Curriculum and evaluation standards for school mathematics: Executive summary*. Reston, VA: National Council of Teachers of Mathematics.

No Child Left Behind Act of 2001, (2002).

Peterson, P. E. (1990). Monopoly and competition in American education. In W. H. Clune & J. F. Witte (Eds.), *Choice and control in American education: The theory of choice and control in education* (Vol. 1, pp. 47-78). London: The Falmer Press.

Peterson, P. E. (1995). A critique of the Witte evaluation of Milwaukee's School Choice Program (Occasional Papers): Program on Education Policy and Governance, Harvard University.

Peterson, P. E., & Howell, W. G. (2003). Efficiency, bias, and classification schemes: Estimating private-school impacts on test scores in the New York City voucher experiment. Cambridge, MA: Program on Education Policy and Governance, Harvard University.

Peterson, P. E., & Howell, W. G. (2004). Efficiency, bias, and classification schemes: A response to Alan B. Krueger and Pei Zhu. *American Behavioral Scientist, 47*(5), 699-717.

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (2nd ed.). Thousand Oaks: Sage Publications.

Rothstein, R. (2004). *Class and schools: Using social, economic, and educational reform to close the black–white achievement gap*. Washington, DC: Economic Policy Institute.

Smith, K. B. (2003). *The ideology of education: The commonwealth, the market, and America's schools*. Albany: State University of New York Press.

Somers, M.-A., McEwan, P. J., & Willms, J. D. (2004). How effective are private schools in Latin America? *Comparative Education Review, 48*(1), 48-69.

Valencia, R. R. (1997). *The evolution of deficit thinking: Educational thought and practice*. London; Washington, DC: Falmer Press.

Walberg, H. J. (2000, July 12). Market theory of school choice. *Education Week, 19,* 46, 49.

Walberg, H. J., & Bast, J. L. (2001). Understanding market-based school reform. In M. C. Wang & H. J. Walberg (Eds.), *School choice or best systems: What improves education?* (pp. 3-38). Mahwah, NJ: L. Erlbaum Associates.

Witte, J. F. (2000). *The market approach to education: An analysis of America's first voucher program*. Princeton, NJ: Princeton University Press.

Witte, J. F., Thorn, C., & Pritchard, K. (1995). Fifth year report: Milwaukee Parental Choice Program: Wisconsin Department of Public Instruction.