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The Effect of Private School Competition on Public School Performance in Georgia

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This article presents estimates of the effect of private school competition on public school performance. Using data on school districts in Georgia, the authors estimate models relating tenth- and third-grade test scores for either reading or mathematics to the level of private school competition. Test scores are not measurably or significantly higher in areas with greater private school competition, a result robust through multiple estimations using three measures of private school competition and a variety of control variables. The authors address the possible endogeneity between test scores and private school competition using instrumental variables estimators, with percentage of the population that is Catholic, county population in 1980, lagged competition, and various other measures as alternative instruments.

Keywords: *private school competition; vouchers; public school performance*

1. Introduction

Given concerns with public school performance, and pleas for increased privatization of government services, proposals intended to enhance school choice and foster competition are popular policy recommendations. Advocates of school choice have argued that the presence of private schools places competitive pressure on public schools, thereby improving their performance (for example, Friedman 1955). To draw inferences about the benefits

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from competition under an enhanced school choice system, researchers have investigated the impact of the level of private school competition on public school performance. Empirical results concerning competitive effects between private and public schools are mixed in that some studies find a significant positive effect while others find no significant effect.[1] Some studies find support for positive effects of competition (Couch, Shughart, and Williams 1993; Hoxby 1994, 2003; Dee 1998; Greene and Kang 2004), while other studies do not reveal significant improvement from competition (Newmark 1995; Simon and Lovrich 1996; Sander 1999; Jepsen 2000; McMillan 2001a, 2001b; Hsieh and Urquiola 2002). Belfield and Levin (2001) reported that a majority of the studies they reviewed found beneficial effects of competition but that the gains are modest.

The importance of the policy issue and the lack of consensus in empirical results indicate that further work in this area is needed. Although no single empirical study can resolve the debate, it is clear that better understanding of the impact of school choice on the quality of public education is needed. In particular, it is necessary to move the debate from rigid positions around whether school choice improves public schools to an environment in which there is more clarity around the conditions and situations in which school choice improves public education and those in which it does not.

This study provides additional empirical evidence to the policy debate. We investigate whether increased private school competition results in enhanced performance of public schools using data from Georgia school systems for both third and tenth grades. Specifically, we estimate models for test scores on both math and reading standardized tests, treating the measure of private school competition as endogenous to the equations.

Our empirical specification differs from earlier models in several ways. First, we augment the instrument set used in the estimation. In previous studies that allowed for the possible endogeneity of the measure of private school competition, the instrument used has been the percentage of Catholics in the population or a related measure. We compute this but use it in conjunction with the level of county population in 1980 and several other potential instruments described below. Although no instrument is perfect, we provide some statistical evidence that supports the validity of this instrument set. (See McMillan [2001b] and Goldhaber and Eide [2003] for discussions of the instruments used in this literature.) In addition, we also present results using lagged values of our measures of private school competition as instruments.

Second, the measure of private school competition that we compute provides an increase in precision over prior studies. Most studies (Jepsen [2002] and McMillan [2001a] are exceptions) measure private school competition as the percentage of *all* students in private schools, which implicitly assumes

that private school enrollment in primary grades (high school) provides competition for public high schools (elementary schools).[2] But public high school teachers and administrators might not view private, primary grade school enrollment as effective competition.[3] Our measures of competition are grade-specific, so that private grade schools compete with public elementary schools and high schools compete with high schools. This should provide a less noisy measure of competition. A final variation is that unlike most earlier studies that focus only on high school, we consider both third-grade and tenth-grade scores on two tests.

We estimate our model under a variety of specifications, including alternative grade levels, measures of competition, instrumental variables, and control variables, and estimate equations using level and first differences. Overall, our results yield very little evidence that public school performance is enhanced by competition from private schools. We discuss possible reasons why existing private school competition may not have a measurable effect on public school performance.

This article proceeds as follows. The next section presents a brief background of this issue. Section 3 explains the empirical models and details the data used in this analysis. Section 4 presents the empirical results. The final section summarizes the article and presents a discussion of possible explanations of the empirical results.

2. Background

A substantial literature exists that argues that the public sector is less efficient than the private sector, and there are many studies that support this position. For example, comparisons of the public and private costs of trash collection have found that the costs for public sector provision are substantially higher. There is also research that compares the outcome (i.e., effectiveness) of private and public education. Early studies, for example, Coleman, Hoffer, and Kilgore (1982), found that private schools performed better than public schools, but the results from more recent studies are mixed.[4]

Several reasons have been posited to explain the lower level of efficiency in the public sector in general and public schools in particular.[5] These theories are generally based on the premise that the government bureaucracy is able to control production either because of a lack of information about costs and outputs or the lack of an alternative source for the public service. Chubb and Moe (1990), for example, argued that the stakeholders in education (unions, educators, and politicians) control the public education system, making the implementation of major reforms infeasible.

In different words, the government bureaucracy can behave like a monopoly. Government agencies are not worried about bankruptcy, and for most services there is little or no competition. Thus, the public sector does not have to worry about cost or the loss of business as a result of inefficient provision of the public service. Furthermore, the lack of competition means that there is no easy way to compare levels of efficiency.[6]

This view of government bureaucracy has led to calls for the introduction of competition in the provision of public services, either through the privatization of public services or the introduction of competition between the government and the private sector. While several arguments can be made in support of vouchers, Friedman (1955) and others have argued for a voucher system as a means of increasing competition in the provision of education. They reason that the competitive pressure that a voucher system provides would lead public schools to be more efficient and effective. Current calls for voucher systems are based in part on the premise that the potential competition from private schools will cause public schools to improve.

The argument that private school competition will result in improvements in public schools is based on the economic theory that competition forces inefficient for-profit firms to improve their performance or suffer economic losses that will eventually put them out of business. In extending this theory to public schools, the assumption is typically made that public school teachers and administrators are concerned with the loss of students because, for example, that could mean loss of revenue or jobs as public support is eroded.[7] The implication is that the school bureaucracy will strive to reduce the inefficiency that is assumed to exist in public schools and increase their efforts to improve effectiveness. The reduced inefficiency or increased effort should lead to higher student performance.

Geller (2000) and Rangazas (1997) presented formal models showing the conditions necessary for a link to exist between increased competition and improved public school performance. Geller and Rangazas pointed out that these conditions may not always be present; there are several plausible conditions or assumptions that would break the theoretical linkage between private school competition and public school performance. Also, Arum (1996) contrasted the economic or "free market" approach with the institutional and political approaches to the linkage between competition and performance and argued that the latter two approaches do not necessarily imply that increased competition will lead to increased public school performance.

These authors have pointed out several reasonable scenarios under which increased private school competition may not result in increased public school performance. For example, the decision to attend a private school may have little to do with the performance of public schools, as measured by aver-

age scores on standardized tests, so that increased effort from school officials might not be rewarded with larger school enrollments. Competition from neighboring public school districts may be sufficiently high that private schools provide no additional effective competition (Hoxby 2000). These possibilities and others are discussed more fully in section 5.

There have been previous empirical efforts to determine whether increased private school competition increases public school performance. Several of these studies (e.g., Simon and Lovrich 1996; Couch, Shughart, and Williams 1993; Arum 1996) ignore the possible simultaneity between public school performance and private school attendance. Jepsen (2002) and Dee (1998) discussed the importance of accounting for this simultaneity. But even among those studies that allow for simultaneity results differ, with some (e.g., Hoxby 1994) finding positive and significant effects, while others (e.g., Sander 1999; McMillan 2001b) obtaining statistically insignificant effects. Thus, it is still an open question as to whether private school competition affects public school performance.

3. Empirical Model and Data

In this section, we first present the empirical model and then discuss the data used in the estimation.

3.1. Model

Previous studies differ in their estimation methodologies. Several treat private school enrollment as exogenous to the test score equation. Other studies have allowed for the endogeneity of the measure of private school competition, arguing that private school enrollment changes in response to changes in public school performance and is also probably correlated with unobservables in the equation's error term. We are persuaded by these arguments and use instrumental variables techniques to address the simultaneity between private school competition and public school performance.

The equation of interest is

$$TEST_j = \beta_0 + \beta_1 COMP_j + \boldsymbol{x}_j\beta_2 + u_j, \quad (1)$$

where

j denotes school district j,
TEST is a measure of school performance,

COMP is a measure of private school competition,
x is a vector of control variables,
βs are parameters to be estimated, and
u is a random error term, assumed to have mean zero and conditional variance σ^2_j.

We measure public school performance by the school district average score for public school students on a mandatory standardized test. We consider both reading and mathematics scores and both tenth grade and third grades. Madaus et al. (1979) suggested that reading and mathematics tests do not simply represent different measures of educational performance but rather measure different aspects of education. In particular, their results indicate that teaching effectiveness has more impact on mathematics than it does other subjects.[8]

COMP represents private school competitive pressure and is measured in alternative ways. The two primary measures we use are private school enrollment as a percentage of the county's grade-specific student body, denoted *PriStud*, and the number of private schools in the county, denoted *PriSch*. Prior studies use concurrent private school enrollment as a percentage of the county's total student population to measure competition. In contrast to other studies that aggregate school enrollments across all grades, we have grade-specific public and private enrollment (and number of schools) for both private and public schools for several years.

Whether *PriStud* or *PriSch* is the better measure of competition is open to debate. More private schools imply more choice, whereas a greater fraction of private school students implies a greater loss of public school students. It is possible that public school officials perceive the opening of a new private school as a threat. Thus, we specify models using both *PriSch* and *PriStud*.

The literature on education production strongly argues that performance should be measured by value added (Cohn and Geske 1990). Therefore, we include eighth-grade test scores from two years prior.[9] Value added is a more appropriate measure of school performance than just the current test score. Furthermore, including the eighth-grade test score for two years prior helps to control for unobservable variables that influence performance. These would include, among others, such factors as family attitude toward education and whether parents read to young children. It is important to attempt some control for these unobservables as we want to estimate the impact of competition on performance, net of these types of influences.

A number of socioeconomic variables have been shown to influence test scores in other studies that estimate education production functions. The control variables we use are based on these studies. Test scores tend to rise

with income and educational levels of the population. They tend to fall with higher poverty rates and minority presence. Some authors, for example, Eberts, Schwartz, and Stone (1990), have maintained that the level of urbanization affects school performance. We also control for expenditures per student since we are attempting to measure efficiency gains due to increased competition. Other control variables were also considered; these did not perform as well and yielded empirical results even less supportive of the principal hypothesis.

The control variables are per capita income, denoted *INCOME;* the percentage of residents who are black, denoted *BLACK;* the percentage of residents older than twenty-four who are college graduates, denoted *EDUC*; the log of instructional expenditures per student adjusted for cost differences across school districts, denoted *log(EXPEND)*; the percentage of households with children between five and eighteen years old that are below the poverty level, denoted *POVERTY*; and population density to differentiate rural and urban areas, denoted *DENSITY.* The test score variables are denoted by *R* for reading or *M* for mathematics and also by the grade and year in which the tests were taken.

We control for competition from other public schools, denoted PUBCOM, using the number of schools in neighboring counties. Note that this differs from our primary measure of private school competition, which is county-based. Public school competition in Georgia arises principally through choices offered in neighboring counties.[10] The number of schools and the number of neighboring school districts outside the home county reflect different types of choices, but we have chosen the number of schools to measure public school competition. School districts might be more appropriate if schools within a district are homogeneous, but they are not. The choice of our primary measures of private school competition follows those used in the literature; for example, the literature on private school competition generally uses county-level private school enrollment to measure private school competition. However, we experiment with alternative measures of public and private school competition, including using private schools in surrounding districts and the percentage of schools that are private.[11]

3.2. Data Sources

Data for this analysis come from five sources. Private school data were taken from the *Unofficial Information on Non-Public Schools in Georgia Submitted to the State Department of Education/Directory of Nonpublic Schools in Georgia* (Georgia Department of Education 1971-1994). This directory includes the name, location, enrollment, and grades covered for

each school. Enrollment figures are restricted to in-state students. The information is detailed enough to identify and exclude private schools that we do not believe are competition for public school students, that is, boarding schools, dependent military schools, and religiously specific schools such as Seventh Day Adventist schools.[12]

The primary advantage of our measure of private school enrollment over the census measure of private school enrollment is that it can be tailored for specific grades. Because enrollment and grades served are both available for each private school, estimated enrollment for any specific grade equals the number of students in that school divided by the number of grades served by that school.[13] We used our private and public school enrollment data to duplicate the measure of private school attendance from the census and obtained similar values for the percentage of students in private schools.

Georgia has 159 counties, each with a school district, and 27 independent (city) school districts. All of the independent districts except for the city of Atlanta are geographically small. Consistent with other researchers, we use counties (not school districts) as the geographic unit to compute our primary measures of private school competition, but in Georgia in most cases the county is the school district. Because families in most independent school districts could conveniently transport their children to private schools outside their municipality, it would be inappropriate to use school districts as the geographic unit for measuring competition. This measure is not perfect, of course, as students can cross county lines to attend private schools, and a few municipalities are near relative population concentrations in neighboring counties. However, this is chiefly a problem in metropolitan areas of Georgia, which have high levels of measured private school competition. Outside urban areas, populations are centralized within counties. However, as an alternative measure of competition, we include private schools in the home county and in adjoining counties.

Although we would prefer to use school- (or student-) level data (see Hanushek, Rivkin, and Taylor 1996), such data are not available. However, because school districts are small, many of them contain only one high school and sometimes only one elementary school. Specifically, more than 66 percent of school districts have only one high school and 43 percent have only one elementary school.

To measure competition from public schools, we collected the number of public schools by grade for all Georgia school districts and all school districts in border counties of the five states adjoining Georgia. Data on the number of public schools in Georgia came from the *Georgia Public Education Directory: State and Local Schools and Staff* (Georgia Department of

Education 1985-1990) for various years. The data for South Carolina and Florida were provided by their state departments of education, and data for North Carolina, Tennessee, and Alabama were provided by the individual school districts. In most districts, the number of schools did not change during the 1980s, and about as many districts experienced decreases as increases.

In 1990, Georgia had 186 school districts. However, for the tenth-grade analysis, we aggregated 6 pairs of school districts and one set of 3 school districts because they shared a high school. Thus, there were 178 observations for the tenth-grade analysis and 186 for the third-grade analysis. The largest school district (DeKalb County) had more than 73,000 students in more than 100 institutions. The smallest district (Taliaferro County) had fewer than 200 students.

The series *Georgia Student Assessment Program Official State Summary* from the Georgia Department of Education (1986-1993) provides norm-referenced test scores (NRTs) and criterion-referenced test scores (CRTs) from 1985 to the present. Because the standard of comparison may vary annually with NRTs (Georgia Department of Education 1986-1993), CRTs are more appropriate when making interyear comparisons. The empirical model was developed using the Basic Skills Test (BST), a CRT required for high school graduation, for the 1987-1988 and following two school years. The model was estimated using reading and mathematics CRTs for third grade. These tests were required of every Georgia public student in the relevant grades but are only reported at the district level. Additional demographic data and an independent measure of private school enrollment were obtained from the 1980 and 1990 *U.S. Censuses of Population and Housing* (U.S. Department of Commerce 1981, 1991). Unpublished data from the Fiscal Research Center, Georgia State University, provided classroom instructional expenditures adjusted for differences across districts in the cost of providing education and full-time equivalent enrollment figures.[14]

4. Empirical Results

Because most of the previous studies have focused on high school results, our results for the tenth-grade data are presented first.

4.1. Tenth Grade

Variable names, descriptions, and descriptive statistics for the tenth-grade data are contained in Table 1. The unweighted mean value of private school

enrollment reported in Table 1 is small because it is unweighted; urban school districts have much greater percentages of students in private schools.

In addition to the results presented in Tables 2 through 4, we estimated numerous alternative specifications of the tenth-grade model as a check on the robustness of our results. Overall, our results provide very little support for the hypothesis that private school competition increases public school performance. In the interest of brevity, we present only selected results, although results from other specifications are briefly discussed.

In both reading and math test equations, the measure of private school competition, whether the number of private schools or the percentage of private school students, is treated as endogenous to the test score equation. As stated above, we believe it is plausible to consider that private school attendance might respond to changes in public school performance. It is also reasonable to consider that private schools might consider both public school performance and the demographics of the area in choosing where to locate. Ignoring this endogeneity would, of course, produce inconsistent parameter estimates, whereas the instrumental variable estimator will yield consistent estimates if the instruments are valid.

We consider the following variables as potential instruments: percentage of the population that is Catholic, denoted *PCCATH*; population levels in 1980, denoted *POP1980*; and the lagged values of the number of private schools, *PriSch(1989)*, or of the percentage of private school students, *PriStud(1989)*. The intuition for our choice of instruments is as follows. The proportion of the population that is Catholic has been used in previous studies. It has a positive correlation with both measures of private school competition as Catholic children are more likely to attend parochial schools. There is no reason to anticipate that the population proportion of Catholics has a direct and independent effect on test scores. In a similar manner, one can argue that past county population levels do not have a direct, independent effect on test scores. If control variables such as urban/rural or density are used to control for the possible impacts of crowding on test scores, past population variables seem even more plausible instruments. The measures of private school competition are likely to be correlated with population because private schools are more likely to locate in more heavily populated areas.

The percentage of the population that is Catholic is low in Georgia relative to the United States as a whole. The unweighted mean of this variable is only 1.2 percent. However, the standard deviation is 1.6 percent, yielding a coefficient of variation of 1.33, which is quite reasonable.[15] Note that the low level of this variable does not invalidate its use as an instrument. Recall that a valid instrument must show a strongly significant relationship with the endogenous right-hand-side variable (in this case, private school competition) yet

Table 1
Descriptive Statistics for Tenth-Grade Data

Variable	Description	Mean[a]	Standard Deviation
M1090	District score on tenth-grade math test (1990)	325.6	4.34
M888	District score on eighth-grade math test (1988)	212.9	4.28
R1090	District score on tenth-grade reading test (1990)	330.7	4.15
R888	District score on eighth-grade reading test, (1988)	208.9	4.05
PriStud (1988)	Percentage of tenth graders in private school (1988)	4.79	5.32
PriStud (1990)	Percentage of tenth graders in private school (1990)	4.10	5.00
PriSch (1990)	Number of tenth-grade private schools (1990)	2.11	3.33
PriSch (1988)	Number of tenth-grade private schools (1988)	2.30	3.57
INCOME	Per capita income	10,679	2,389
DENSITY	Population density	284.93	548.86
PUBCOMP	Number of public tenth-grade schools in surrounding counties	15.50	14.83
BLACK	Percentage of population that is black	26.28	17.27
POVERTY	Percentage of households with children below poverty	17.31	7.61
EDUC	Percentage of adults college educated	11.60	6.49
EXPEND	Instructional expenditures per high school student (1990) ($100)	26.69	3.19
PCCATH	Proportion of the population that is Catholic	.012	.016
$N = 178$			

a. Unweighted.

should not exert its own independent effect on the model's dependent variable (public school performance). We demonstrate that the first condition is met below and have presented arguments for the second condition. Additionally, we do not rely only on the percentage Catholic but combine it with other instruments.

Results of the first-stage, reduced-form regressions are given in Table 2. Despite the relatively low levels of percentage Catholic across Georgia counties, this variable has a precisely estimated large positive effect on the number of private schools. The coefficient indicates that if the percentage Catholic in Georgia increases 10 percentage points, say from the mean of 4.6 percent to 14.6 percent on average, the number of private schools will increase by almost seven schools. The second instrument is population from 1980, this variable also has a positive and statistically significant effect on the number of private schools. An average county population increase of about

Table 2
First-Stage Regressions (robust *t*-statistics in parentheses)

	(1) PriSch90	(2) PriSch90	(3) PriStud90	(4) PriStud90
Intercept	2.235	–4.402	34.09	–11.54
	(11.15)	(–0.78)	(0.77)	(–1.35)
PUBCOMP	–0.019	–0.010	–0.98	–0.004
	(–0.91)	(1.10)	(–3.25)	(–0.48)
M888	–0.039	–.014	0.224	0.016
	(–0.85)	(–0.65)	(1.34)	(0.36)
R888	–0.030	0.014	–0.505	–0.012
	(–0.57)	(0.51)	(–2.66)	(–0.24)
DENSITY	0.001	0.0002	–.0007	–0.0006
	(2.23)	(1.09)	(–0.87)	(–2.94)
BLACK	0.024	0.0005	0.102	–0.002
	(2.92)	(0.11)	(3.01)	(–0.29)
EDUC	–0.030	–0.012	0.173	0.023
	(–0.78)	(–0.72)	(1.64)	(1.18)
INCOME	0.0005	0.0001	0.0005	–2.89E–5
	(3.29)	(2.47)	(1.82)	(–0.30)
log(EXPEND)	0.864	0.391	2.64	1.364
	(0.81)	(0.73)	(0.64)	(1.81)
POVERTY	0.017	0.013	–0.102	0.013
	(0.57)	(1.18)	(–1.25)	(0.69)
POP1980	2.01E–5		–1.704E–6	
	(2.42)		(–0.22)	
PCCATH	69.471		51.085	
	(4.13)		(1.99)	
PriSch (1989)		0.873		
		(29.03)		
PriStud (1989)				0.952
				(40.28)
R^2	.78	.96	.30	.94

five thousand people would increase the number of private schools by about 0.1. The *F*-statistic testing the joint significance of the two instruments has a *p*-value of essentially zero. The explanatory power of the regression is quite reasonable. Finally, a standard Hausman test for overidentifying restrictions cannot reject the null that the instrument set is uncorrelated with the errors in the equation of interest.

The results from the first-stage regression for the alternative measure of private school competition are less satisfactory. Although percentage Catholic has a large and statistically significant impact on the percentage of private school students (a 10 percentage point increase in the Catholic population is

estimated to increase the number of private schools by around five), the coefficient on 1980 population is not precisely estimated. The test of overidentifying restrictions cannot reject the null of valid instruments, but the test has lower power due to the weakness of one instrument. This first stage regression has a low R^2, indicating that the instrumental variable (IV) estimates will be relatively less precise.[16]

Although these first-stage regressions are reduced forms, it is nonetheless interesting to consider the estimation results for the other control variables. These results give some indication of what drives the establishment of private schools and private school attendance. In the regression for number of private schools, the variables income, population density, and population percentage that is black have positive and statistically significant coefficients. Interestingly, we estimate negative effects of public school test scores on the number of private schools, although these estimates have large standard errors. Other control variables had very small and imprecisely estimated impacts.

The first-stage regression results are somewhat different when we use the percentage of students who attend private schools as the dependent variable. Here increases in public school competition lowers private school attendance as does public school reading test scores. Income and percentage black in the population continue to have statistically significant positive impacts. The density results, and possibly the effect of income, probably simply reflect the fact that more schools and thus more students locate in or near more urbanized areas. The same cannot be said for the public school variables and the black population percentages, however, as these variables are much less correlated with urban areas.

Table 3 contains estimation results for an IV estimator for both reading and math test score equations for the tenth grade. The computed standard errors are robust to heteroskedasticity of general form.

Our primary finding is that an increase in the number of private schools *(PriSch)* has a small but statistically significant negative impact on public school test scores. This result is robust; the estimated coefficient is between approximately –0.18 and –0.27 in all of the specifications we tried. Roughly speaking, the results imply that an increase of one private school per county (which would be a very large increase in the number of private schools) would reduce average math scores by about one-quarter of a point. The effect on reading scores would be somewhat smaller.

Equations using the percentage of private school students *(PriStud)* as the measure of competition yield negative estimated coefficients that are small in magnitude and not precisely estimated. For example, if the percentage of private school students increased by 2 percentage points, average reading and

Table 3
Tenth-Grade Test Scores: Instrumental Variable (IV) Estimates
(robust *t*-statistics in parentheses)

	(1) Reading	(2) Math	(3) Reading	(4) Math
Intercept	262.958	186.728	253.515	191.55
	(10.33)	(7.50)	(12.42)	(9.55)
PriSch (1990)			–0.235	–0.271
			(–2.20)	(–2.39)
PriStud (1990)	–0.327	–0.403		
	(–1.10)	(–1.46)		
Eighth-grade test (1988)	0.345	0.558	0.413	0.579
	(3.22)	(7.30)	(6.92)	(9.94)
BLACK	–0.060	–0.021	–0.082	–0.055
	(–1.69)	(–0.57)	(–4.46)	(–3.02)
EDUC	0.174	0.153	0.123	0.097
	(1.82)	(2.00)	(1.87)	(1.70)
INCOME	0.0004	0.0003	0.0003	0.0003
	(1.52)	(1.50)	(1.87)	(1.75)
log(EXPEND)	–0.800	2.189	–1.48	0.952
	(–0.34)	(0.76)	(–0.81)	(0.49)
POVERTY	–0.015	0.013	0.010	0.039
	(–0.28)	(0.20)	(0.25)	(0.76)
DENSITY	0.0008	0.0008	0.001	0.001
	(1.31)	(1.20)	(2.60)	(2.41)
PUBCOMP	–0.050	–0.056	–0.018	–0.017
	(–1.48)	(–1.69)	(–0.98)	(–0.93)
R^2	.62	.56	.69	.67
$N = 178$				

Note: Instruments are percentage Catholic and population in 1980. Results using Gini coefficients on income and percentage of county population belonging to black Baptist churches are available from the authors on request. Additional specifications using different measures of school inputs were also run. The results from these models do not change the essential results and are also available on request.

math test scores would fall between about 0.2 and 0.6 points. Neither measure of private school competition yields results consistent with the hypothesis that public schools' performance improves in response to private school competition.[17]

The results for the control variables are roughly similar across the various estimated equations, and the signs are generally as anticipated. The coefficients on lagged test scores, in both the reading score and math score equations, are positive and very precisely estimated. This variable measures the unobservable parental and school attributes that affect standardized test

scores. To the extent that these characteristics are stable over time, this variable controls for these important but unobservable influences. The coefficient on percentage black is negative and significant, and the coefficient on percentage college educated is positive (as expected) but is only marginally significant. The coefficient on *INCOME* is positive, although not precisely estimated. The coefficient itself is very small; a $1,000 increase in per capita income raises the school district's test scores by only 0.3 points.

The coefficient on *POVERTY* has a very large standard error in both equations. The coefficient on the measure of public school competition is usually negative but is very small in magnitude. Population density has a weak positive effect, although the estimated standard error is small in some specifications. The point estimate of the coefficient on log of expenditures per student is negative in several specifications, but the estimated standard error is very large. It is not unusual for an expenditure variable to be insignificant in educational production functions (Hanushek 1986). We also considered alternative measures of school resources, for example, teachers per FTE student and enrollment and enrollment squared, to possibly capture economies of scale. These variables generally had negative coefficients with very large standard errors and our basic results were unchanged.

Because our primary results run counter to the standard hypothesis about the impact of competition and actually seem to indicate that competition from private schools hurts public school performance, we estimated a number of variations of our models.

A second IV strategy is to use the lagged value of the measure of private school competition as an instrument. Thus, if we use the percentage of private school students in 1990 as our competition measure, we obtain our predicted value from a reduced-form regression using the percentage of private school students in 1988, along with the other exogenous variables.[18] To the extent that we have controlled for time-invariant unobservable influences on test scores that might also correlate with private school competition, these are valid instruments. Although the instruments used in the first strategy (percentage Catholic and population) appear to be reasonable instruments, they have less explanatory power, particularly in the percentage private student equation. The lagged value of the percentage private students, on the other hand, has a high level of explanatory power (Table 2). So if the lagged value is a valid instrument, we would expect the results using this strategy to be more efficient.[19]

The results using this approach to the instruments yielded negative and significant coefficients on the private school variable for both the reading and math equations (columns 2 and 4 of Table 3). Results using the other mea-

Table 4
Alternate Model Specifications

	(1) Reading[a] (IV)	(2) Math[a] (IV)	(3) Reading (OLS)	(4) Math (OLS)
Intercept	253.551	191.422	243.692	197.570
	(12.42)	(9.55)	(19.18)	(16.51)
PriSch (1990)	–0.238	–0.208		
	(–3.21)	(–2.69)		
PriSch (1988)			–0.185	–0.182
			(–2.46)	(–2.47)
Eighth-grade test (1988)	0.413	0.587	0.413	0.586
	(6.97)	(10.24)	(6.95)	(10.20)
BLACK	–0.082	–0.058	–0.084	–0.059
	(–4.54)	(–3.18)	(–4.65)	(–3.25)
EDUC	0.124	0.094	0.126	0.098
	(1.91)	(1.71)	(1.92)	(1.75)
INCOME	0.0003	0.0003	0.0003	0.0002
	(1.86)	(1.56)	(1.58)	(1.40)
log(EXPEND)	–1.478	0.809	–0.0005	0.0003
	(–0.81)	(0.42)	(–0.77)	(0.45)
POVERTY	0.010	0.040	0.006	0.037
	(0.25)	(0.77)	(0.15)	(0.71)
DENSITY	0.001	0.001	0.001	0.001
	(2.50)	(2.21)	(2.36)	(2.16)
PUBCOMP	–0.018	–0.017	–0.016	–0.015
	(–0.98)	(–0.97)	(–0.88)	(–0.87)
R^2	.69	.67	.69	.67
$N = 178$				

Note: IV = instrumental variable; OLS = ordinary least squares.
a. IV estimates using lagged values of PriSch as the instrument.

sures of private school competition, and longer lags for the instrument, were similar to those reported.

In another model, we assume that public school performance changes slowly in response to competition, so that test scores from 1990 are regressed (using ordinary least squares [OLS]) directly on the number of private schools or the percentage of private school students from 1988, or 1985, or 1983.[20] These models yield results that are almost identical to the ones reported in Table 3. Columns 3 and 4 of Table 4 contain these results using the number of private schools in 1988. The results using *PriStud* are similar, that is, the sign of the coefficient is negative. Using *PriSch* and *PriStud* from earlier years produced coefficients with even larger standard errors.

Broadening our measure of private schools to include not only the number of private schools in the county but also those in all adjacent counties did not produce results that are supportive of the hypothesis that private school competition leads to better public school performance. Likewise, using the percentage of schools that are private produced similar results.[21]

In another set of models (not reported here), we excluded urban school districts to see whether our results are driven by the complexity associated with measuring private school competition in the Atlanta area. Still another model allowed for the impact of private school competition to vary with per capita income in the county. To the extent that public school quality varies directly with income, this specification would allow private school competition to have different impacts on high- and low-quality public schools. These specifications did not yield qualitatively different results.

BLACK is used to control for differences in socioeconomic background of students. However, there are other variables that also measure socioeconomic characteristics, in particular, lagged test scores. The lack of significance of the coefficients on other control variables may be due to the presence of *BLACK* in the equation. When *BLACK* is excluded, the magnitude and significant level of the coefficients on several control variables change in the directions consistent with expectations. For example, the coefficient on *POVERTY* becomes negative and significant when *BLACK* is excluded. In Georgia, it is not just urban school systems that are largely minority, so *BLACK* is not a proxy for urban. But racial attitudes may lead to greater private school enrollment, which would imply that *BLACK* is positively correlated with private school competition. However, excluding *BLACK* from the equation did not change the results for private school competition.

4.2. Empirical Results for Third Grade

Most of the research to date addresses the effects of competition on the performance of high school students. It might be more appropriate to consider the effects of competition on elementary school students. Because education is likely to be a function of past learning, recent changes in teaching effort may have limited effects in high school. It could be that changing high school students' performance is profoundly more difficult, whereas primary school students may be more responsive to recent increases in instructional efforts.

Data matching that used to investigate the tenth grade is also available for the third grade. Descriptive statistics of the third-grade data are in Table 5. A difference between the tenth- and third-grade data sets is that there are eight

Table 5
Descriptive Statistics for Third-Grade Data

Variable	Description	Mean[a]	Standard Deviation
R390	District score on third-grade reading test, 1990	215.56	5.73
M390	District score on third-grade math test, 1990	211.84	5.89
R188	District score on first-grade reading test, 1988	213.15	6.98
M188	District score on first-grade math test, 1988	213.32	6.30
PriStud (1988)	Percentage of third graders in private school, 1988	4.43	5.44
PriStud (1990)	Percentage of third graders in private school, 1990	4.05	5.32
PUBCOMP	Number of public elementary schools in adjoining counties	47.14	55.17
EXPEND	Real instructional expenditures per primary student ($100)	26.54	2.90
$N = 186$			

a. Unweighted.

more observations in the latter set; several county school districts in Georgia share high schools; none share elementary schools.

Only the tenth-grade specifications reported in Tables 2 and 3 were estimated using the third-grade data. The results are consistent with those for the tenth grade, that is, they provide no support for the primary hypothesis. In the interest of space, only the results using the percentage private students *(PriStud)* to measure competition are reported in Table 6. The results presented in columns 1 and 2 use percentage Catholic and population in 1980 as the instruments, while the results in columns 3 and 4 use the lagged value of *PriStud*. In none of the third-grade equations we estimated is the coefficient on school competition significant. When the measure of competition is the number of private schools *(PriSch)*, the estimated coefficient is negative, but this effect is not precisely measured. In the models (not reported here) in which we measure competition as the percentage of private schools, the coefficients are sometimes estimated to be positive, but the standard errors are very large. The control variables behave roughly the same as in the tenth-grade regressions, except the coefficient on the log of per-pupil expenditures, which is negative and significant, an unexplained result.

Table 6
Third-Grade Test Scores (robust *t*-statistics in parentheses)

	(1) Reading[a] (IV)	(2) Math[a] (IV)	(3) Reading[b] (IV)	(4) Math[b] (IV)
Intercept	214.98	188.055	161.967	138.682
	(7.86)	(6.23)	(12.79)	(8.37)
PriStud (1990)	–0.034	–0.082	–0.003	0.012
	(–0.14)	(–0.32)	(–0.05)	(0.16)
First-grade test (1988)	0.275	0.356	0.278	0.368
	(4.13)	(4.13)	(4.86)	(4.94)
BLACK	–0.070	–0.068	–0.075	–0.081
	(–1.3)	(–1.43)	(–2.23)	(–2.40)
EDUC	–0.025	–0.020	–0.027	–0.035
	(–0.30)	(–0.26)	(–0.40)	(–0.54)
INCOME	0.0006	0.0006	0.0006	0.0005
	(2.00)	(1.85)	(2.30)	(1.96)
log(EXPEND)	–7.64	–6.87	–0.003	–0.003
	(–2.49)	(–2.28)	(–2.60)	(–2.32)
POVERTY	–0.128	–0.0874	–0.126	–0.077
	(–1.36)	(–0.86	(–1.41)	(–0.82)
DENSITY	0.001	0.0005	0.001	0.001
	(1.63)	(0.69	(1.71)	(0.73)
PUBCOMP	–0.004	–0.010	–0.003	–0.009
	(–0.47)	(–1.44	(–0.47)	(–1.35)
R^2	.58	.53	.58	.54
N =186				

a. Instrumental variable (IV) estimates using percentage Catholic and population in 1980.
b. IV estimates using two-year lagged value of PriStud as the instrument.

4.3. Differences Model

A final attempt to measure the effect of competition was made using models in first difference form. The motivation for these models comes from the concern that there are too many unobservable and unmeasurable variables that influence public school test scores. It is common to difference data to control for unobservable variables that could influence the variable of interest or that could be correlated with explanatory variables that appear in the model. To the extent that the unobservables remain unchanged over time, the first difference specification will sweep them out of the equation. Despite a fairly full set of control variables, including previous years' test scores, it seems possible that there remain other characteristics of parents and communities that could affect test scores but that we cannot observe.

A first difference specification for these data is not entirely satisfactory, primarily because we do not have true panel data and because the changes in public school test scores and in our measures of competition are simply not very large. Because district average public school test scores typically change slowly, the dependent variables in the first difference models show little variation. We consider both two-year and four-year differences but report only the results for the two-year differences. Some of our demographic control variables are obtained from census data, so that we are modeling two-year and four-year changes in test scores as functions of decade changes in adult education levels or poverty levels.

Despite these concerns, we estimated a differences model using a two-year (1988-1990) and four-year (1986-1990) change in public school test scores and lagged two-year (1986-1988) and four-year (1984-1988) changes in our measures of private school competition, namely, lagged changes in the percentage of students who are private students and lagged changes in the number of schools that are private.

The control variables are the same as for the level equations, only measured as two-year or four-year changes, or ten-year changes for census variables. To control for cohort effects, we use changes in eighth-grade test scores between 1986 and 1988 for the regression for tenth-grade scores and changes in first-grade test scores for the regression for third-grade scores.

The results using two-year changes for the tenth grade are reported in Table 7. The coefficient on the change in the percentage of students in private school is significant and positive in the reading test equation. This result is consistent with the primary hypothesis, but the results for the other three equations are not supportive of the hypothesis. We also ran regressions using four-year differences in test scores and private school competition. For these equations (which are not reported), the coefficient on the change in number of schools that are private is significant and positive for the reading test equation.

We tried many variations of the difference model using tenth-grade test scores, and the results were not consistent with the competition hypothesis. For example, we used a four-year change in private school competition and a two-year change in test scores allowing that a school district's reaction to changes in private school competition may reflect changes over a longer period of time. In none of the four regression equations was the coefficient on private school competition significant (these results are not reported).

For the third-grade test scores, the first difference versions of the models provide no support for the hypothesis (Table 8). Thus, using a difference equation model, we find virtually no evidence that increased competition leads to higher public school test scores.

Table 7
Ordinary Least Squares (OLS) First Difference for Tenth-Grade Test Scores (1988-1990) (*t*-statistics in parentheses)

	(1) Reading	(2) Math	(3) Reading	(4) Math
Intercept	0.374	0.972	0.725	1.24
	(0.34)	(0.78)	(0.67)	(0.98)
PriStud (1986-1988)			0.243	0.178
			(2.02)	(1.29)
PriSch (1986-1988)	0.121	0.012		
	(0.92)	(0.83)		
Eighth-grade test	0.343	0.491	0.342	0.488
(1984-1986)	(5.13)	(6.87)	(5.17)	(6.84)
BLACK	–0.055	–0.041	–0.055	–0.040
	(0.93)	(0.61)	(0.93)	(0.59)
EDUC	0.090	0.253	0.115	0.271
	(0.64)	(1.60)	(0.83)	(1.71)
INCOME	–0.00008	–0.0003	–0.00016	–0.0003
	(0.714)	(1.13)	(0.69)	(1.33)
EXPEND	0.001	0.005	0.001	0.005
	(0.77)	(3.12)	(0.82)	(3.14)
POVERTY	0.010	0.005	0.013	0.007
	(0.19)	(0.08)	(0.26)	(0.12)
DENSITY	–0.00006	–0.001	–0.0007	–0.002
	(0.03)	(0.58)	(0.41)	(0.80)
PUBCOMP	–0.072	–0.058	–0.130	–0.098
	(0.043)	(0.31)	(0.76)	(0.51)
R^2	.166	.283	.182	.287
$N = 178$				

Note: Independent variables are measured as change.

5. Discussion

The empirical results do not lend support to the hypothesis that private school competition improves public school performance, as measured by student exam results. In only two of the many difference models estimated did we find a positive and significant effect of competition on tenth-grade reading test scores. The results for other equations, regardless of the measure of competition, the test, and the grade, are inconsistent with the competition hypothesis.

Institutional considerations may account for why our empirical results do not support the competition hypothesis. For increased competition to result in increased performance, there must be a mechanism that links the external

Table 8
Ordinary Least Squares (OLS) First Difference for Third-Grade Test Scores (1988-1990) (*t*-statistics in parentheses)

	(1) Reading	(2) Math	(3) Reading	(4) Math
Intercept	–0.479	–0.016	–0.594	–0.026
	(0.41)	(0.01)	(0.50)	(0.02)
PriStud (1986-1988)			–0.004	0.002
			(0.83)	(0.33)
PriSch (1986-1988)	–0.39	–0.004		
	(2.13)	(0.19)		
First-grade test	0.224	0.140	0.227	0.141
(1986-1988)	(4.61)	(1.83)	(4.61)	(1.84)
BLACK	–0.050	–0.097	–0.057	–0.099
	(0.76)	(1.14)	(0.85)	(1.16)
EDUC	–0.109	–0.267	–0.111	–0.272
	(0.69)	(1.32)	(0.70)	(1.34)
INCOME	0.0002	0.0002	0.0003	0.0002
	(1.03)	(0.61)	(1.04)	(0.60)
EXPEND	0.002	0.002	0.002	0.002
	(1.32)	(0.75)	(1.34)	(0.79)
POVERTY	–0.044	–0.147	–0.052	–0.148
	(0.77)	(1.99)	(0.90)	(2.01)
DENSITY	0.001	0.002	0.001	0.002
	(0.57)	(0.60)	(0.54)	(0.57)
PUBCOMP	0.095	0.087	0.102	0.089
	(0.60)	(0.43)	(0.63)	(0.44)
R^2	.151	.062	.133	.062
$N = 185$				

Note: Independent variables are measured as change.

pressure of increased competition to behavioral changes by administrators and teachers that in turn results in increases in student performance.

Some conditions bias against a prediction that private school competitive pressure will positively affect public school performance. Consider the following:

1. Existing private schools may not be substitutes for public schools. Religious, ethnic, or socioeconomic considerations may dominate all other considerations including performance. We excluded schools for which we were very sure that enrollment was based on factors other than public school performance, for example, Mennonite schools. Perhaps even larger numbers of private schools than we have excluded are not competitors with public schools. Private schools in Georgia do not fall under any mandated standards for cur-

riculum, content, or teacher qualification. There are voluntary accrediting associations, but no universal standards. Thus, quality is likely to vary widely, and hence at least some private schools may not be perceived as an academic substitute for public schools.

2. Public schools may operate efficiently without shirking by administrators under existing competitive levels. This efficiency could be driven by any of many socioeconomic forces, including Tiebout (1956)–style selection of school districts. Thus, increased private school competition may not yield increased public school performance.
3. On the other hand, perhaps private school competition in Georgia is simply too low, even on the margin, and that much greater levels of competition than now exist would be necessary to have measurable effects. Hoxby (2003) made this point. A number of industrial organization studies suggest that there are critical levels of concentration and that variations in competition that do not cross that critical level do not impact institutional performance (Dalton and Penn 1976). We experimented by allowing our private school competition variable to have a different slope when measured competition was high; there was no support for the premise that higher levels of competition generate an effect on performance.
4. Administrators may be motivated by competitive factors. However, these factors may not impact teacher behavior, and so the effects may not flow from administrators to students.
5. The presumed motivation for administrators to perform better is a concern over the loss of students, either in and of itself or because of the consequences of the loss of students such as loss of funding or jobs. But at least some administrators may not be concerned about the loss of students.[22] For example,
   - Public school administrators may not care about the loss of resources that comes with lower enrollments. Their personal income and working conditions may be independent of the resources allocated to their district.
   - Public school administrators may prefer lower enrollments if that causes an increase in per-student funding, that is, if the elasticity between total funding and number of students is less than one.[23]
   - Public school administrators may prefer lower enrollments due to school overcrowding. With the rapid growth in many Georgia school districts, overcrowding has been a problem. However, in unreported results, we find no evidence that slower growing districts are more responsive to private school competitive pressures.
6. If parents who are actively involved in public schools decide to send their children to private schools, public school performance could actually decline due to reduced parental involvement (McMillan 2001b).
7. If private schools attract the best students and if there are positive peer-group effects on lower-performing students, then increased enrollment in private schools may cause performance in public schools to decline even in the presence of increased effort on the part of public school teachers and administrators.

8. A possible interpretation for our models' generally negative measured impact of competition is that we are measuring the effect of some parents removing their bright children from public schools regardless of the school's performance, rather than the competitive pressure created by private schools. This "cream-skimming" effect, which would lower public schools' average test scores, could operate simultaneously with the competition effect. It is methodologically problematic to formulate a model that will distinguish between cream skimming and competition. Thus, our results might indicate that the negative impact of cream skimming overwhelms any smaller positive impact of competition.
9. Voters may actually desire reduced public school enrollment since that could reduce property taxes.

Our results lead to the question of why an effect would be present on the national level as shown by Hoxby (1994) and Dee (1998) but absent in our results. One possible reason is that our sample is much smaller than that for Hoxby and Dee. However, our sample is larger than that used by Couch, Shughart, and Williams (1993), who found positive and significant effects. Also, Jepsen (2002) and McMillan (2001a) used samples that are similar in size to those of Hoxby and Dee but found no significant effects.

There is another possible empirical reason. Hoxby's (1994) and Dee's (1998) primary explanatory variable is the percentage of the local population that is Roman Catholic. As noted above, Georgia, and the entire Southeast, has a relatively low density of Catholics. If the difference between the results is driven by this demographic difference, Hoxby's and Dee's results may not generalize to all private schools but may apply only to Catholic schools.[24]

Hoxby (1994) used micro data (NLSY78) to measure her dependent variables. Jepsen (2000) showed that if one allows for the correlation among respondents in the same geographic area, the standard errors increase. When Jepsen reestimated Hoxby's model adjusting for this correlation, he found that the effect of competition is not significant.

The contrast between Hoxby's (1994) results and our results provides some insights. Catholic schools are close substitutes for public schools in that they function like neighborhood schools in many ways. They have ethnically and economically diverse student bodies and tend to have strong academic programs. Also, Catholic school student bodies are not restricted to Catholics; compared to many other religious schools, they are diverse religiously (Hoxby 1994). Many of Georgia's private schools serve racially, religiously, or economically specific groups or were established to offer academic programs specifically designated to exclude instruction on certain topics such as evolution or human reproduction. One would not expect enrollment in such schools to be driven by differences in academic perfor-

mance between public and private schools but by differences in other characteristics that public school administrators are not authorized to change.

Policies to promote private schools in order to prompt public schools to improve their performance must be tailored to fit that agenda. Merely increasing the number of private schools may not improve public school performance in all environments.

Notes

1. Rouse and McLaughlin (1998), Belfield and Levin (2001), and Gill et al. (2001) provided excellent reviews of the literature on the effects of school competition on performance of public schools.

2. Jepsen (2002) measured competition using grades K-8, 9-12, and K-12. There are very small differences in the resulting coefficients and standard errors.

3. If the effect of private schools on public school performance operates through competition for students, matching performance and competition by grade should yield more precise estimates of the effect of competition.

4. For a review of this literature, see McEwan (2000). There are also studies that measure the level of inefficiency in the provision of public services; for studies of relevance to education, see Ruggiero (1996) and Duncombe and Yinger (1998).

5. See Duncombe, Miner, and Ruggiero (1997) for a discussion of some of the models of bureaucracy.

6. However, local governments do have to be concerned with residents moving to another jurisdiction and comparisons of government efficiency can be made across jurisdictions.

7. However, we are unaware of any empirical evidence that shows that the objective of public schools is to maximize the number of students.

8. There are alternative measures of performance used in other papers, for example, dropout rates and the percentage of students going on to college. Unfortunately our data do not include this information. Of course, performance measures such as dropout rates and percentage of students going on to college are not relevant to third grade.

9. This is the standard way of measuring value added in education and assumes of course that the cohorts taking the two tests are the same. In our case, while the cohorts should be similar, they are not likely to be identical.

10. Several studies, for example, Greene and Kang (2004) have measured public school competition with the Herfindahl Index constructed using school districts within the county. However, in 1990 in Georgia, 132 counties had just one school system while 27 counties had two districts.

11. While charter schools are another source of competition, there were no charter schools in Georgia at that time.

12. We excluded dependent military schools, exclusive religious schools, and small ungraded private schools. Low-enrollment, ungraded schools often closed within a few years and had poor reputations or were unknown to local educators (based on informal telephone calls to schools and school district offices) and were excluded from the count. Dependent military schools and some religious schools did not draw students from the same population as public schools. Mennonite, Seventh Day Adventist, and some Orthodox Yeshivas reported that their student bodies consisted essentially of all school-aged members of their denominations. This was established through telephone calls to the schools. Exclusive enrollment is not enforceable formal policy but is pronounced in these cases.

13. Ungraded programs were considered to serve twelve grades, unless they served fewer than forty-eight students, in which case they are excluded.

14. The education cost index was constructed by combining the index suggested by Chambers and by McMahon. Chamber used a hedonic wage model to estimate teacher salary difference across districts controlling for factors outside local district's control. McMahon estimated cost of living difference across districts based on factors such as housing costs, per capita income, and population density. Both a Chambers and McMahon index were estimated, weighted, and combined. The share of each district's expenditures on salaries and benefits was calculated. The Chambers index was weighted by that share, while the MaMahon index was weighted by one minus that share. See Chambers (1995) and McMahon (1996) for explanations.

15. Catholics account for 4.6 percent of the state's population; there are fifteen states (mostly in the South) with a percentage Catholic that is 10 percent of less. Using the name of the private school as an indicator of whether the private school is Catholic, we find that 7.9 percent of private schools are Catholic.

16. The correlation between the number of private schools and the percentage private school students is .42. There is large variation across counties in the size of private schools.

17. Using just percentage Catholic as the instrument does not alter the conclusions. An anonymous referee suggested as possible instruments measures of affiliation with other religious groups and measures of income heterogeneity. We explored this possibility using Gini coefficients for income and several religious variables. We found that the Gini coefficient was helpful in the private school regression and the percentage of the population that claims affiliation with black Baptist churches was helpful in the private school student equation. Instrumental variable regressions using these as instruments made virtually no difference to our results.

18. Because this second estimation strategy is exactly identified, tests of overidentifying restrictions are not possible. We decided not to use all instruments together due to concern for finite sample bias in highly overidentified equations.

19. While current test scores clearly cannot cause prior year private school attendance, one might believe that districts with historically good public schools are more or less likely to have consistently more or less private school competition. This could render the instrument invalid.

20. While we do not have panel data, our data set does contain test score and private enrollment variables for several years.

21. Using the percentage of students attending private schools regardless of grades yielded results that were consistent with the results reported above but with coefficients even less precisely measured than the grade-specific measures.

22. This is not to suggest that schools never compete for students. Schools might worry about enrollments particularly if enrollment approached the level that could lead to the closing of the school.

23. Teske et al. (2000) found that schools that have lost students to charter schools have been cushioned financially by the state and district.

24. Campbell (2001) found that Catholic schools do perform differently from other private schools in terms of civic education.

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