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The Effect of Private School Competition on Public School Performance

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Abstract - This paper investigates the effect of private school competition on public school performance. We present a simple theoretical model that shows the many linkages needed in order for increased competition to result in improved performance, and present reasons why those linkages might be weak or non-existence in reality. We improve on previously published work in that we can better control for the endogeneity between private school enrollment and public school performance. Multiple approaches provide very little evidence that current levels of private school competition increase public school performance in Georgia.

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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. Many advocates of school choice have argued that the presence of private schools places competitive pressure on public schools, and thereby improve their performance (for example, Friedman 1955). In order to draw inferences about the benefits from competition under an enhanced school choice system, researchers have investigated the effects of the current level of private school competition on public school performance. However, the empirical results concerning competitive effects between private and public schools are mixed.[1] Some find support for positive competitive effects (Couch, Shughart, and Williams 1993; Hoxby 1994), while other studies do not reveal significant improvement from competition (Newmark 1995).

Couch, Shughart, and Williams (1993) (hereafter "CSW") present empirical estimates that indicate that public schools in North Carolina counties with higher levels of private school enrollment also had higher grades on the End of Term Test for Algebra I. However, there are some concerns with the consistency of CSW's estimates. Although CSW acknowledge that there is reason to expect endogeneity between private school enrollment and public school performance, their results are based on OLS estimates that treat private school enrollment as an exogenous variable.[2]

Newmark (1995) replicated CSW's results, but also estimated equations using alternative standardized exams, various measures of private school competition, and various combinations of control variables. Newmark finds that CSW's results are not robust; in none of Newmark's alternative regressions is the estimated effect of private school competition positive and significant.

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[1] Rouse and McLaughlin (1998) provide an excellent review of the literature on the effects of school competition on performance of public schools.

Perhaps the strongest empirical support for competition having positive effects on public schools comes from Hoxby (1994). Hoxby uses an instrumental variables (IV) approach in a nation-wide study to show that public schools perform better in areas where they face more competition from private schools. Specifically, using density of Roman Catholics as the instrument for private schools, she finds that public high schools' outcomes are better in areas with more competition.

The existing empirical evidence could be improved and supplemented in a number of ways. Most authors note a strong potential for endogeneity between public school outcomes and private school competition, even though not all authors have controlled for it. The absence in most data sets of appropriate instruments for the measure of private school competition makes it difficult to handle the endogeneity between this variable and public school outcomes. Some researchers measure student performance by using exams whose scores are available for only one year or that are administered to only a subset of students and thereby weakening the usefulness of the test as a measure of overall school performance.

We investigate whether increased private school competition results in enhanced performance of public schools using a pooled data set from Georgia school systems between 1980 and 1990 for third and tenth grades for reading and math test scores. The data set allows us to address the endogeneity problem directly. We estimate regressions using lagged measures of competition as well as a model expressed in first differences. We find little evidence that private school competition results in increased public school performance.

This paper proceeds as follows. The next section presents a framework of how private competition can affect public school performance and investigates the conditions for a beneficial competitive effect. Section three explains the empirical models and details the data used in this

[2] They indicate that they tested the null hypothesis that private school enrollment was exogenous to the test score equation, but based on the information provided in their paper, their test statistic is inappropriate.

analysis. Section four presents the empirical results. A summary and conclusion section completes the paper.

2. A Model of School Competition

This section presents a simple theoretical model based on Geller (2000) that shows how an increase in access to private schools can lead to an increase in the performance of public schools. We consider a single public school administrator (who acts on behalf of the public school) and an arbitrarily large set of heterogeneous households. We assume there is a perfectly elastic supply of public and private schools and that within each sector schools have identical performance.

2.1. Behavior of Households

Assume that each household: (1) has one child whom the household chooses to send either to public or to private school; (2) has a fixed, net of tax endowment $\boldsymbol{I}$, and; (3) has a fixed taste (denoted Θ) for either public school education or private school education. There is a non-education related composite consumer good $\boldsymbol{X}$ with a price of one, $p_x = 1$. Let the performance of public schools be denoted f_b and the performance of private schools be denoted f_v.[3]

School taste (Θ) varies continuously, with low values associated with a strong preference for public schools and high values associated with a strong preference for private schools. This is a measure of preference for private schools per se, not for any performance they may have.

Let p_v denote the exogenous and uniform cost of attending private schools. We interpret a decrease in p_v to mean that access to private schools has increased, and thus p_v serves as measure of private school competition to public schools.[4] For convenience, we assume that attending public school is costless to the households.

[3]As "p" is already used to denote prices, we use the dominant internal consonants "*b*" "*v*" and "*f*" as abbreviations for "public," "private," and "performance."

[4]Different measures of access and competition that might serve equally well are the number of or distance to private schools. We use the more inclusive measure of broadly conceived price because the substitutability of public and private schools is central to our investigation, and relative price is essential in investigation of substitute goods.

Households compare the potential utility of sending their students to each type of school, sending the students to whichever school yields the higher total utility. The utility maximization problem for households is:

$$
(1) \quad \text{Max} \begin{cases} U_{max}: u_b = u_h(f_b, \mathbf{X}, \Theta) \\ U_{max}: u_v = u_h(f_v, \mathbf{X} - p_v, \Theta). \end{cases}
$$

We assume that $\boldsymbol{I}$ and Θ are distributed continuously and independently and are uncorrelated with any variation that may exist in student's capacity to learn.[5] We further assume that the utility functions are continuous and that in equilibrium there is at least one student in each of the public and private schools. From the assumptions of continuity and independence, it follows that there will be at least one household for whom the difference in utility between the two school systems is arbitrarily small.[6]

As private school performance increases or its access cost decreases, the utility any household could derive from private school enrollment increases. As potential utility from private school enrollment increases or potential utility from public school enrollment decreases, public school enrollment decreases. Thus, the number of public school students (s_b) is given by:

$$
(2) \quad s_b = s(f_v, f_b, p_v, \Theta, I).
$$

2.2 Behavior of the Administrator

By assumption, there is one public school administrator who exerts effort to improve public school performance. The administrator's utility (u_a) is assumed to be a function of the amount of effort exerted on the job (e_a) and the number of students in public school (s_b):

[5] This model permits, but does not require, that students vary in their capacity to learn, i.e. their responsiveness to administrator effort.

(3) $u_a = u_a(e_a, s_b)$.

Public school enrollment may represent other variables of possible concern to administrators such as the allocation of resources or the social standing of the administrator. We assume, however, that performance does not directly enter the administrator's utility function. Since administrator utility is a function of enrollment, and enrollment is a function of public school performance, the model is simplified by not having performance enter the administrator's utility directly.

Public school performance is assumed to be a function of administrator effort and the exogenously determined school resources per student (*r*):

(4) $f_b = f(e_a, r)$.

Assume that the administrator's utility decreases with effort at increasing rates and increases with the number of students at diminishing rates. In order to ensure an interior solution, we assume that at low levels of effort, the marginal utility from effort through the number of students is greater than the marginal disutility of effort.

Substituting (4) into (2) and (2) into (3) allows the administrator's utility to be expressed as:

(5) $u_a = u_a(e_a, s(f_v, f_b(e_a, r), p_v, \Theta, I))$.

The utility maximization condition for the administrator is:

(6) $\partial u_a / \partial e_a = - \partial u_a / \partial s_b \;\; \partial s_b / \partial f_b \;\; \partial f_b / \partial e_a$.

An exogenous decrease in p_v, i.e., an increase in private school competition, affects only one partial in equation (6), the middle right hand side term. This cross partial ($\partial^2 s_b / \partial f_b \partial p_v$) is negative. Since the right hand side carries a negative sign, the left-hand side must decrease. A decrease in the

[6] See Ben-Akiva and Lerman (1985) for further exposition of such discrete choice models.

marginal utility of effort implies an increase in effort itself. Thus, increased private school competition can lead to increased administrator effort, and so increased public school performance.

While this model is simple, its does illustrate the linkages necessary for increased private school competition to affect public school performance. Several possible, reasonable conditions or assumptions exist that would break this linkage. To list a few, the choice of private school may have little to do with the performance of public schools; public school competition may be sufficiently high that private schools provide no additional effective competition; administrators may not be able to translate their increased effort into greater effort on the part of teachers, and; many private schools may not perform any better than public schools. These possibilities are discussed more fully in section five.

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. Empirical Model

The basic empirical equation of interest is:

$$(7)\quad TEST_j = \exists_0 + \exists_1 COMP_j + X_j \exists_2 + u_j,$$

where:

j is a school district,

TEST is a measure of school performance,

COMP is a measure of private school competition,

X is a set of control variables, and

u is a random error term.

We measure public school performance by the average school district score for public school students on a standardized test, either reading or mathematics, and for either 10th grade or 3rd grade. Test scores are available for various years.[7] Reading and mathematics tests are not simply different measures of educational performance, but rather potentially measure different aspects of education. Madaus *et. al.* (1979) shows that teaching effectiveness impacts mathematics more than it does other subjects.

COMP represents private school competitive pressure and is measured in two alternative ways: private school enrollment as a percentage of the county's student body, denoted *PriStud*, and private schools as a percentage of all schools in the county, denoted *PriSch*. CSW and Newmark used concurrent private school enrollment as a percentage of the county's student body; in addition to that, we also have grade specific public and private enrollment for various years. The number of private and public schools is also grade specific and available for various years.

Although we use both, we consider private schools rather than private students to be the better measure of competitive pressure since it seems that the critical issue in competition is choice. Intuitively, competition for students might be greater if more school options are available. We also think that the relative number of private schools rather than the absolute number might be preferred since one could argue, for example, that three private schools would provide more competitive pressure for a district with one public school as compared to a district with ten public schools.

A number of socioeconomic variables have been shown to influence test scores. Test scores tend to rise with income and educational levels in the population. They tend to fall with higher poverty rates and some minority presence. Some authors, for example Eberts, Schwartz and Stone (1990), maintain that the level of urbanization and school expenditures affect school performance.

[7] Test scores are measured at the school district level, while the control variables, other than prior year test scores, are measured at the county level. See section 3.2 for a discussion.

The demographic control variables, which are from 1990 are: per capita income, denoted *INCOME;* the percentage of residents who are black, denoted *BLACK;* the percentage of residents older than 24 who are college graduates, denoted *EDUC*; the average instructional expenditures per student, denoted *EXPEND*; the percentage households with children between 5 and 18 years old that are below the poverty level, denoted *POVERTY*, and; population density, denoted *DENSITY*.

Our model adds two additional control variables beyond those used by others: test scores in a prior year and public school competition. A long-standing problem in empirical studies that attempt to explain student performance is the difficulty of controlling for unobservable variables that influence performance. These include factors such as family attitude toward education, whether or not parents read to young children, etc. In order to mitigate the bias introduced by the omission of these variables, we include test scores from two years, two grade levels earlier. For example, 1990 (1989-1990 academic year) third grade reading scores are regressed against 1988 first grade reading scores. Thus, the earlier scores are tests from the same students to the extent that the student body has remained constant.

We control for public school competition, denoted *PUBCOM*, with the number of schools serving the grade in question in adjoining counties.[8] Adjoining counties were used instead of adjoining districts, because counties are the more uniform geographic unit. Martinez-Vazquez and Seaman (1985) argue that since public schools vary in demographics and performance even within systems, the number of schools is an appropriate measure of competition. See also Hoxby (2000)

3.2. Data Sources

Data for this analysis come from five sources. Private school data were taken from the *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 schools which we do not believe are competition for public school, i.e., boarding schools, Dependent Military Schools, and religiously specific schools such as Seventh Day Adventist schools.

Our measures of private schools and private school enrollment are computed using the number of private schools in each Georgia county. Using Georgia Department of Education data, we count as local competition only local private schools and include all Georgia resident students attending them, even students from other counties. This measure misses schools in other counties that draw away local students, but does include schools in separate school districts within a county. 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.[9]

Georgia has 159 counties, each with a school district, and 27 independent (i.e., municipal) school districts. All of the independent districts, except for the city of Atlanta, are geographically small. We use counties as the geographic unit of measure for private school competition rather than school districts because families in most independent districts could conveniently transport their children to private schools outside their municipality. This measure is not perfect of course, as students can cross county lines to attend private schools, and a few municipalities are near relative

[8]Adjoining counties with no direct road access were excluded.

[9] Ungraded programs were considered to serve 12 grades, unless they served fewer than 48 students. 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.

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 even with our methods. Outside urban areas, populations are centralized within counties.

In order to measure public school competition, the number of public schools by grade was collected for all Georgia school districts and all school districts in counties 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 experienced decreases as increases.

In 1990 Georgia had 186 school districts. However, for the 10^{th} grade analysis we aggregated six pairs of school districts and one set of three school districts because they shared their high schools. Thus, there were 178 observations for the 10^{th} grade analysis and 186 for the 3^{rd} grade analysis. The largest school district (DeKalb County) had over 73,000 students in over 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 (NRT) and criterion referenced test scores (CRT) from 1985 to the present. Since the standard of comparison may vary annually with NRTs (Georgia Department of Education 1986-1993), CRTs are more appropriate when comparing over time. The empirical model was developed using the Basic Skills Test (BST), a CRT required for high school graduation, for the 1987-88 and following two school years. These tests are required of every Georgia public student in the relevant grades. Additional demographic data and an independent measure of private school enrollment were obtained from the 1980 and 1990 *US Censuses of Population and Housing* (US Department of Commerce 1981 and 1991). Unpublished data from the Fiscal Research Program, Georgia State University provided classroom instructional expenditures adjusted for differences across districts in the cost of providing education and full time equivalent enrollment figures.

4. Empirical Results

Three basic models are considered. The first is a model that essentially repeats previous empirical work, but that provides consistent estimates of the conditional mean parameters. Second, we estimate a re-specified model that extends CSW in a theoretically appealing way. Finally, we estimate a first differences model that perhaps controls for important unobservable variables more effectively.

The existence of data by grade level permits the development of empirical models with one set of data and testing it with another. This procedure avoids pretest bias and precludes the possibility that extensive specification search drives the empirical results, a potential difficulty noted by Newmark (1995), Couch and Shughart (1995), Chubb and Moe (1993), and Lee and Byrk (1993). Because previous studies have focused on high school results, tenth grade data serves for developing the empirical model. The model is then tested on third grade data.

The tenth grade empirical results are presented first, and then we apply the model to the third grade data and draw conclusions. Finally, we present the results from a differences version of the model.

4.1. Empirical Results for 10th Grade Using Levels

In this section we report results using 10th grade test scores. Variable names, descriptions and descriptive statistics for the 10th grade data are contained in Table 1. The mean 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. The mean percentage of schools that are private is much larger than the mean percentage of students in private schools because most private schools in Georgia are small.

We first replicated CSW's results using concurrent percentage of students in private school irrespective of grade, i.e., using enrollment from the 1990 Census of Population. These models, which are not reported here, did not yield results consistent with the hypothesis that increased competition will result in higher public school test scores.[10] We also used concurrent, grade specific school enrollment in private schools as a percentage of total district enrollment to measure competition (these results are not reported here). The coefficients on the measures of private school competition are negative, contrary to the hypothesis, for both reading and math test score, with t-statistics of -1.93 and -1.63 respectively. We experimented with numerous variations in the set of control variables; the results were inconsistent with the hypothesis that private school competition leads to higher test scores.

The concern with using concurrent enrollment is that if public schools experience low test scores, some students may leave the public school system, so that a concurrent enrollment variable may be endogenous to the equation. To control for the endogeneity we used an instrumental variable (IV) estimator with lagged private school enrollment as the instrument. Columns 1 and 2 of Table 2 present the results using the instrumental variables (IV) estimates for the reading and math score equations, respectively, where the measure of competition is the concurrent year's percentage of students in private schools.

The estimated coefficients on the competition variable are negative, contrary to expectations. For the equation using reading scores, this coefficient shows that a one percentage point increase in students in private schools results in a 0.08 point drop in average test scores, a result that is statistically significant at the 10 percent level, but very small. For the equation using math scores, the coefficient is also negative, but the effect is smaller and not statistically significant.

For both equations, the percentage of students in private schools in 1988 was used as the instrument for the level in 1990. The results from the instrument equation, though not presented here, indicated that the lagged percentage of students in private schools is very strongly associated with the current level. The R-squared for this equation is 0.87. In this and other equations reported below, we experimented with different lengths of lags for the competition variables, but found very little difference in the estimates, although the standard errors increase with longer lags. We also experimented with alternative sets of control variables, but again this did not produce significantly different results.

Comparing our results to those found previously, recall that CSW and Newmark used similar measures of private school competition, i.e., percentage of the county's students attending private school. One difference, however, is that our measure distinguishes enrollment by grade, so that competition for 10th grade students is provided by the percentage of 10th grade students attending private schools. Another difference is that we are able to use IV estimators, with a very good instrument. Thus, our reproduction of CSW, with Georgia data, provides no support for the finding that private school competition improves public school performance.

The second model specification measures competition using the two-year lagged percentage of students attending private schools in the county. This specification makes an important generalization over previous work in that it allows public school teachers' and administrators' response to competition to take time in order to have an impact on test scores. This measure allows time for public schools to react to increased competition and does not require the use of an

[10] Results not presented in the paper are available from the authors.

instrument. Current year test scores are not known by either school teachers and administrators or by parents at the beginning of the school year, the time when one would expect parents to make decisions about where their children will be attending school. However, as time passes, poor performances by public schools could cause parents to make other plans for their children.

Results of this model specification are given in columns 3 and 4 of Table 2. These equations can be estimated consistently using OLS because the measure of competition is exogenous to current year's test scores. For both reading and math scores, the coefficient on lagged percentage of students in private schools is negative, but not statistically significantly different from zero.

A similar specification uses the two-year lag of the percentage of schools that are private schools as the measure of competition from private schools. These results are contained in columns 5 and 6 of Table 2. The coefficient on this measure of competition is positive for both the reading scores and the math scores equations, but the coefficients are imprecisely estimated, so that the null of no effect cannot be rejected. We also used the number of private schools in place of the percentage of schools that are private; the coefficients are negative and significant (these results are not reported here).[11]

Although the model specifications that allow competition to have a lagged impact on public school performance have intuitive appeal, none of these specifications (or those with different lags) yield results that are consistent with the notion that increased private school competition results in better public school performance.

A possible interpretation of the negative coefficient on the competition variable is that current private school enrollment measures the effect of parents removing their bright children from low-scoring public schools, rather than the competition created by private schools. This "cream skimming" effect, which would lower public schools' average test scores, could operate simultaneously with the competition effect. In order to take into account this possibility, we estimate an IV model that includes the concurrent percentage of *students* in private schools and the lagged percentage of *schools* that are private, along with the control variables. To the extent that private schools cream skim, the larger the percentage of private students, the lower the average performance of the remaining public school students.

These results, given in Table 3, yield some ground on which to argue that private schools provide competition for public schools. The coefficients on the percentage of grade-specific students attending private schools are negative and are statistically significantly different from zero at better than the one- percent level. The coefficient on the relative number of private schools lagged two years is positive and significant at the 5 percent level for the reading equation and positive but insignificant for the math equation. Note, however, that the coefficients are very small, e.g., a one standard deviation increase in the relative number of private schools is associated with a 10.7 percent of a standard deviation increase in test scores.[12] These results are not very robust; use of longer lags and different control variables typically yielded insignificant coefficients on *PriSch*.

The results from the instrument equation are included in Table 3. They indicate that, as previously stated, the two-year lagged percentage of students attending private schools is closely related to the current year's percentage, and that the overall explanatory power of the instrument equation is satisfactory to warrant its use as an instrument.

The results for the control variables are roughly similar across the various estimated equations and the signs are generally as anticipated. An interesting result is the very precisely estimated positive coefficient on lagged test scores, in both reading score and math score equations. This variable was included to approximate the unobservable parental and school attributes that

[11] We also restricted our sample to non-urban districts, with no change in the findings.

affect standardized test scores. To the extent that these characteristics are stable over time, this variable controls for these important, but unobservable influences. The percent black is negative and significant and percent college educated is positive but significant only for the reading equation. *INCOME* and *POVERTY* are both positive and insignificant. Dropping *INCOME* does not change the results other than to slightly reduce the standard errors of the other control variables. Expenditures per student and density have weak effects, consistent with the literature. The coefficient on public school competition is negative, but insignificant.

4.2. Empirical Results for 3rd Grade

Most of the research to date addresses effects of competition on the performance of high school students. It can be argued that it is 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 may be that changing high school student's performance is profoundly more difficult, whereas primary 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 4. A difference between the 10th and 3rd grade data sets is that there are eight more observations in the latter set; several county school districts in Georgia share high schools; none share elementary schools.

Only the final 10th grade IV model specification (Table 3) was estimated using the third grade data, and only after the specification was selected using 10th grade data. The results are presented in Table 5. The coefficients on our measure of competition, i.e., the lagged grade specific percentage of schools that are private, *PriSch*, are negative but very imprecisely estimated. The coefficient on our measure of cream skimming, i.e., the grade specific percentage of students in

[12] When the two-year lag of the number of private schools is used, the coefficients are negative and significant at the 10

private school (*PriStud*), is negative for reading equation and positive for the math equation, but both are highly insignificant. These results do not support the hypothesis that competition from private schools improves the performance of public schools, nor our conjecture that concurrent enrollment measures cream skimming.

The control variables behave roughly the same as in the 10th grade regressions. Note that for the third grade, the coefficient on expenditures is negative and significant, an unexplained result.

4.3. Differences Model

As an alternate way to control for unobservable school and parental characteristics that influence average test scores, we also specify a differences model using a two-year (1988 – 1990) change in public school test scores. We use three alternative grade-specific measures of the change in competition: the simultaneous change in private students as a percentage of total students, lagged changes in the percentage of students who are private students, and lagged changes in the percentage of schools that are private.

The control variables are the same as for the level equations, only measured as two-year changes, except for Census variables. To control for cohort effects, we use changes in 8th grade test scores between 1986 and 1988 for the regression for tenth grade scores and changes in 1st grade test scores for the regression for third grade scores. Census data necessitates decade-long differences, and requires the assumption that the change in census variables between 1980 and 1990 is correlated with the change in those variables between 1988 and 1990.

As with the levels model, we used the 10th grade data set to pursue an extensive search of potential specifications for the differences model. The results from the 10th grade equations (not reported) do not support the hypothesis that competition increases public school test scores; in particular, a differences model equivalent to the IV model reported in Table 3 produced insignificant

percent level. The coefficients on the percentage of students who are in private schools are negative and insignificant.

coefficients on the two variables of most interest (alternative specifications did not yield results supportive of the hypothesis). The third grade data also yielded results inconsistent with the competition and cream skimming hypotheses.

5. Summary and Conclusions

The theoretical framework showed that under the given assumptions, utility maximizing effort by the public school administrator increases in response to increases in access to private schools. Because public school performance is an increasing function of administrator effort, in the model better access to private schools leads to higher performance in public schools.

The empirical results do not lend support to the hypothesis that private school competition improves public school performance, as measured by student exam results. The only model that yielded a positive and significant coefficient for the competition variable was for only one of the measures of competition (percentage of schools that are private) using tenth grade reading test scores. The results for other measures of competition, for math tests, for third grade scores, for other lags of the percentage of schools that are private, and for the differences models are inconsistent with the competition hypothesis.

One explanation for the lack of consistency between the theoretical framework and the empirical results is that the assumptions of the model may not match real world conditions. There are alternative assumptions that are potentially consistent with reality that would lead to a prediction that private school competitive pressure will fail to positively affect public school performance. Consider the following:

1. Private schools may not be substitutes for public schools. Religious, ethnic or socioeconomic considerations may dominate all other considerations including performance (i.e., $\partial s_b / \partial f_b$ maybe zero). We excluded schools for which we were very sure that enrollment was based on factors other than public school performance, e.g., Seventh Day Adventists. Perhaps even larger

numbers of private schools than we have excluded are not competitors with 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 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. A number of industrial organization studies suggest that there are critical levels of concentration ratios, 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. Likewise, the assumption that administrators prefer more students (i.e., that $\partial u_a / \partial s_b > 0$) could fail in at least three ways:

5. Public school administrators may not care about the loss of resources that comes with lower enrollments. For example, their personal income and working conditions may be independent of the resources allocated to their district.

6. Public school administrators may prefer lower enrollments because it causes an increase in per-student funding where there is funding from set property taxes.

7. Public school administrators may prefer lower enrollments due to school overcrowding. With the rapid growth in many Georgia school districts, overcrowding was a

problem. However, in unreported results, we find no evidence that slower growing districts are more responsive to private school competitive pressures.

Our results lead to the question of why an effect would be present on the national level as shown by Hoxby (1994), but absent in our results. There is a possible empirical reason. Hoxby's primary explanatory variable is the percentage of the local population that is Roman Catholic. The Southeast has a relatively low density of Catholics, and even by regional standards, Georgia has few Catholics; seventy counties are less than one percent Catholic (Glenmary Research Center 1992). If the difference between the results is driven by this demographic difference, Hoxby's results may not generalize to all private schools, but may apply only to Catholic schools (and the other well-established religious systems she addresses).

The contrast between Hoxby's and our results, in the light of the theory developed above, provides important 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 have academic programs specifically designated to exclude instruction on evolution or human reproduction. One would not expect enrollment in such schools to be driven by differences in academic performance between public and private schools, but by differences in other characteristics which 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, as envisioned for example by Friedman and Friedman (1979), may not improve public school performance in all environments.

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Table 1. Descriptive Statistics for 10th Grade Data

Variable	Description	Mean[a]	Std Dev
PriStud (1988)	% of 10th Graders in Private School, 1988	4.79	5.31
PriStud (1990)	% of 10th Graders in Private School, 1990	4.10	5.00
PriSch (1988)	% of 10th Grade Schools are Private, 1988	36.44	26.05
INCOME	Per capita income	10679	2389
DENSITY	Population density	284.93	548.86
PUBCOM	Number of Public 10th Grade Schools in surrounding counties	15.50	14.83
BLACK	Percent of Population that is Black	26.28	17.27
POVERTY	Percent of households with children below poverty	17.31	7.61
EDUC	Percent of adults college educated	11.60	6.49
EXPEND	Instructional Expenditures per high school student, 1990 $100	26.69	3.19
N = 178			

[a] Unweighted

Table 2. 10th Grade Test Scores (t-statistics in parentheses)						
	Reading	**Math**	**Reading**	**Math**	**Reading**	**Math**
Intercept	241.908 (18.00)	194.975 (15.93)	241.429 (17.92)	194.936 (15.92)	234.027 (17.04)	192.363 (15.35)
PriStud (1990-IV)	-0.080 (-1.73)	-0.078 (-1.59)				
PriStud (1988)			-0.064) (-1.60)	-0.067 (-1.58)		
PriSch (1988)					0.006 (0.79)	0.003 (0.39)
8th Grade Test (1988)	0.426 (6.77)	0.602 (10.58)	0.429 (6.81)	0.603 (10.60)	0.466 (7.30)	0.617 (10.64)
Black	-0.082 (-4.59)	-0.056 (-2.89)	-0.083 (-4.63)	-0.056 (-2.90)	-0.091 (-5.19)	-0.066 (-3.46)
Educ	0.126 (2.18)	0.96 (1.56)	0.119 (2.08)	0.091 (1.49)	0.107 (1.87)	0.082 (1.34)
Income	0.0002 (1.14)	.0002 (0.89)	0.0002 (1.12)	0.0002 (0.89)	0.0001 (0.70)	0.0001 (0.58)
Expend	-0.0005 (-0.71)	.034 (0.71)	-0.0005 (-0.76)	0.0002 (0.36)	-.0005 (-0.78)	0.0002 (0.25)
Poverty	0.005 (0.12)	0.0003 (0.41)	0.005 (0.11)	0.033 (0.69)	0.018 (0.40)	0.042 (0.87)
Density	0.0008 (1.71)	0.0009 (1.66)	0.0009 (1.89)	0.001 (1.83)	0.0008 (1.70)	0.001 (1.69)
PubComp	-0.025 (-1.34)	-0.025 (-1.26)	-0.024 (-1.29)	-0.025 (-1.24)	-0.015 (-0.83)	-0.017 (-0.87)
R^2 N =178	0.685	0.667	0.683	0.667	0.680	0.662

Table 3. Table 2. 10th Grade Test Scores
istics in parentheses)

Dependent Variable	**Second Stage Results 10th grade test scores**		**First Stage Results PriStud (1990)**	
	Reading	Math	Reading	Math
Intercept	237.040 (17.46)	191.596 (15.41)	14.214 (0.89)	1.423 (0.11)
PriStud (1990-IV)	-0.137 (-2.52)	-0.125 (-2.15)		
PriSch(1988)	0.017 (1.99)	0.014 (1.50)	0.865 (27.97)	0.867 (27.63)
8th Grade Test (1988)	0.446 (7.04)	0.615 (10.70)		
10th Grade Test (1988)			-0.047 (-1.00)	-0.009 (-0.23)
Black	-0.082 (-4.61)	-0.055 (-2.87)	-0.002 (-0.16)	0.003 (0.18)
Educ	0.129 (2.26)	0.100 (1.63)	0.078 (1.72)	0.070 (1.54)
Income	0.0002 (0.89)	0.0001 (0.70)	-0.00003 (-0.21)	-0.00003 (-0.21)
Expend	-0.0003 (-0.04)	0.0004 (0.60)	0.0004 (0.72)	0.0004 (0.78)
Poverty	0.015 (0.32)	0.041 (0.84)	0.008 (0.23)	0.012 (0.35)
Density	0.0008 (1.57)	0.0008 (1.54)	-0.001 (-3.05)	-0.012 (-3.13)
PubComp	-0.023 (-1.26)	-0.024 (-1.20)	-0.008 (-0.53)	-0.007 (-0.46)
R^2 N =178	0.692	0.671	.868	0.867

Table 4. Descriptive Statistics for 3rd Grade Data

Variable	Description	Mean[a]	Standard Deviation
PriStud (1988)	% of 3rd Graders in Private School 1988	4.43	5.44
PriStud (1990)	% of 3rd Graders in Private School 1990	4.05	5.32
PriSch (1988)	% of 3rd Grade Schools that are Private 1988	25.77	19.80
PUBCOM	Public 3rd Grades in Adjoining Counties	47.14	55.17
EXPEND	Real Instructional Expenditures per Primary Student $100	26.54	2.90
N = 186			

[a] Unweighted

Table 5. 3rd Grade Test Scores istics in parentheses)				
Dependent Variable	**Second Stage Results** **3rd grade test (1990)**		**tage Results** **PriStud (1990)**	
	Reading	Math	Reading	Math
Intercept	163.665 (14.58)	158.262 (12.77)	8.969 (1.37)	11.169 (2.08)
PriStud (1990-IV)	-0.018 (-1.03)	-0.007 (-0.35)		
PriSch(1988)	0.018 (0.22)	-0.017 (-0.19)	0.919 (34.36)	0.912 (34.11)
1th Grade Test (1988)	0.273 (5.86)	0.272 (5.30)		
3rd Grade Test (1988)			-0.045 (-1.53)	-0.058 (-2.33)
Black	-0.72 (-2.60)	-0.095 (-3.11)	-0.012 (-0.93)	-0.013 (-1.09)
Educ	-0.026 (-0.31)	-0.036 (-0.38)	0.049 (1.39)	0.048 (1.38)
Income	0.0006 (2.66)	0.0006 (2.32)	-0.00002 (-0.15)	0.00001 (0.11)
Expend	-0.003 (-2.47)	-0.002 (-1.60)	0.0001 (0.21)	0.0001 (0.27)
Poverty	-0.129 (-1.99)	-0.091 (-1.26)	0.021 (0.78)	0.025 (0.90)
Density	0.001 (1.37)	0.0005 (0.58)	-0.00005 (-0.14)	-0.00006 (-0.19)
PubComp	-0.004 (-0.53)	-0.008 (-0.96)	-0.001 (-0.29)	-0.001 (-0.44)
R^2 N =185	0.586	0.522	0.912	0.914