Can Competition Improve Educational Outcomes?

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Abstract

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A prime motivation behind parental choice of their children's school is to unleash the benefits of competition to obtain improved educational outcomes. However, neo-institutional theories of democratic governance differ in their expectations for changes in student outcomes. The competing theories are tested using third grade educational outcome measures for a sample of children who attended Georgia's universal prekindergarten program. This program allows parents of four-year-olds to choose among a wide variety of tuition-free preschools operated by private-for-profit firms, not-for-profit organizations, and local public schools. Longitudinal data from a probability sample of children who participated in Pre-K during the 1996-1997 school year are used to estimate the effects of naturally occurring variations in institutional structures on students' outcomes after four years of schooling. Competition, as measured by the Herfindahl Index, results in lower retention rates and improved third grade reading and math test scores but does not significantly affect and teachers' ratings of school readiness during elementary school. Private organizations react to greater competition by producing higher levels of math and reading test scores while public schools lower retention rates and increase school readiness where competition is greater. Competition increases the likelihood of retention for the children most at risk but increases their tests scores.

Can Competition Improve Educational Outcomes?

1. Introduction

Direct control of schools by democratic institutions has been one of the most hotly debated public policy topics in recent years. Until relatively recently, the necessity of the direct provision of universal education for imparting literacy and knowledge required for a democratic society was largely unchallenged, along with the belief that the external benefits from such an education justified public funding. Decoupling public funding of schools from the operation of schools has become the focus of fierce policy debates and stimulated research about its causes and consequences. Milton Friedman (1962) originally stirred the controversy in the United States arguing that, "the actual administration of educational institutions by the government, the 'nationalization,' as it were, of the bulk of the 'education industry' is much more difficult to justify …" than the need for public funding for education (p. 89). Friedman viewed the practice of funding public schools by directly providing services as largely taken for granted, a holdover from a more agricultural society, when government run schools may have been a necessity to guarantee access to education in sparsely populated, rural areas. By lending his credibility and support to the right of parents to choose where and how their children are educated, he began the process to legitimate public policy proposals to decouple funding and provision of education services.

Friedman (1962) originally recommended that the government provide educational vouchers to parents, which the parents could turn into a school as payment for one year's worth of education at any approved school, be it public, private or parochial. He assumed that vouchers would unleash a competition for students and competition would improve educational outcomes: "vouchers would permit competition to develop. The development and improvement of all schools would thus be stimulated" (1953, p. 93). However, this assumption has been challenged in the contentious debates about school choice and the linkage between vouchers

and parental choice, competition, and school effectiveness has become the focus of intense theoretical and empirical scrutiny in recent years.

2. The Neo-Institutional Theory of Competition and Related Evidence

At the first level, the pro-market neo-institutional theory relating competition to improved educational performance is straightforward: if schools are dependent upon recruiting, enrolling, and keeping students for funding, they will adapt their services to the needs of the parents and students. Since parents, and possibly students, will have a say in deciding which school to attend, schools will seek to develop and exploit relative advantages to maximize their funding. School administrators will strive to maximize their own utility by filling classes and maintaining maximum enrollments, which will induce them to take actions that will enhance educational performance (Geller, et al. 2001). In order to maximize the benefits to students, parents will select schools for their children that maximize each child's human capital by choosing schools that will instill the highest levels of skills and knowledge. Pro-market neo-institutional theorists contend that the current exclusive arrangement that places all schools that receive public funds under the direct control of democratic institutions thwarts the potential benefits that would be derived from a competitive marketplace for students.

Chubb and Moe (1988; 1990), who are archetypal pro-market theorists, argued that public schools, as democratically controlled institutions driven by political forces and bureaucratic procedures, were *inherently* incapable of responding to student needs and improving school performance. The inherent inferiority of public schools, according to their pro-market neo-institutional argument, is that interest groups successfully use political processes to establish bureaucratic rules and procedures that institutionalize benefits for themselves at the expense of the public.[1] In this way, persistent pressure and political clout are transformed into

[1] Meier, Pollinard and Wrinkle (2000) show that Texas educational bureaucracies respond to poor performance by increasing the number of school administrators and these increases are associated with increasing the number of teachers. They do not report any direct, positive effects of the size of the bureaucracy on student performance, but

enduring benefits for groups who have the highest stakes in public schooling, such as teachers, school administrators, local board members, and colleges that train teachers. To be clear, they find fault with system of democratic governance of public schools, which allows vested interest groups to supplant the interests of parents and children, not with teachers or administrators who serve in the schools. Parents and children who have no direct or immediate financial stake in how the schools are run receive more diffuse and uncertain benefits from improved schools and, therefore, have fewer incentives to lobby themselves or to hire lobbyists to secure benefits for themselves. Therefore, according to Chubb and Moe (1988), reform of the current system is unlikely to happen, unlikely to work if it does happen, and improved education outcomes are likely only if (1) the relationship between public funding for education is severed from direct administration of public schools; (2) schools are more autonomous, that is independent from control of state governments, local school boards, and school district bureaucracies; (3) public funding for any school is dependent upon the willingness of parents to enroll their children in the school.

From the perspective of the most ardent neo-institutional theorists of this stripe, currently available tests of competition have limited bearing on the validity of competition as a motivating force for improving educational outcomes. The findings from these studies are constrained in their direct bearing on the theory of competition because (1) the gravitational pull of the neighborhood school contaminates the comparisons because of selection issues (Teske and Schnieder, 2001); (2) private school tuition reduces the direct competition between public and private schools augmenting selection bias concerns; (3) current voucher programs which target

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there is a direct effect of bureaucratic size on increasing the number of teachers. While the data show that educational bureaucracies respond to demands from their environment as the authors contend, it is unclear whether they are responding to the incentives of the Texas accountability system or to parental demands. It is also unclear that the response to increase the size of the bureaucracy is not precisely the response to poor performance that Moe and Chubb and others who adhere to the institutionalization of vested interests argument would predict.

high poverty families have such limited reach in terms of affecting public school enrollments that incentives to loosen bureaucratic rules and procedures in public schools are minimal. Studies which compare performance in public and private schools are not directly relevant to arguments about the effects of competition, since public funding and direct administration of schools are so tightly coupled in the U.S.

Several studies have attempted to test the effects of competition in the U. S. For example, in one of the better studies of competition to provide educational services, Hoxby (1994) finds that more competition among school districts results in higher test scores, graduation rates, and lower costs of schooling. Looking at competition at the county level, she finds greater competition between public and private schools leads to higher levels of educational attainment and higher wages. In two other studies that utilize the enrollments in private schools as the measure of competition, the findings support the relationship between competition and higher student performance (Borland and Howsen 1992; Couch, Shughart, and Williams 1993). However, Smith and Meier find lower or insignificantly different levels of performance based on the percentage of students enrolled in public schools within counties in Florida (1995). Teske and Schneider (2001) summarize the research in this way: "While not all of these studies conclude that choice enhances performance, it is significant to note that the best ones do, and that the authors did not find *any* study that documents significantly lower performance in choice schools, controlling for student background" (p. 619, emphasis in original). Thus, the primary hypothesis of the pro-market theorists, that is, greater competition for students leads to better student outcomes, remains open, with the evidence to date, indicating that the differences, when found, run slightly in favor of competition.

In addition to testing the primary hypothesis, two corollary hypotheses are central to the theoretical arguments about competition that will be tested in the current study: the first deals with public versus private school performance; the second deals with stratification. Chubb and Moe (1990; 1988) argue that educational outcomes will improve *if and only* if schooling is

decentralized and schools are virtually autonomous, thereby freeing school personnel to react to parents' demands rather than institutionalized interests. Current institutional hierarchies prevent public schools from being responsive to the needs of students and parents, and, therefore, schools directly controlled democratic bodies and administered by the bureaucracies that these institutions establish will chronically and consistently under-perform. In short, even if competition is introduced, private schools will outperform public schools. Smith and Meier (1995), neo-institutional theorists with a more positive view of democratic governance, offer a counter proposal, that "The existing system can and has made reforms that improve educational performance" (p. 42, also see Meier, Pollinard and Wrinkle, 2000). Other noted scholars have suggested that the lack of incentives undermine performance improvements in public schools (Hanushek 1994) and therefore, if the incentives are corrected by competition or greater accountability, there is no inherent reason that public schools cannot perform as well or better than private schools. Recent evidence suggests that high stakes accountability is indeed improving public school performance (Loeb and Carnoy, 2003; Raymond and Hanushek, 2003).

The second hypothesis is not examined by a simple, straightforward test of public versus private school effectiveness per se. This is a test of a proposition generated from the neo-institutional theory: the institutional hierarchies in which public schools are currently embedded inhibit them from responding to incentives for performance. Therefore, if the theory holds public schools performance should not respond significantly to greater or lesser degrees of competition. Private schools, freed from red tape and institutional rules that constrain public schools from providing services that maximize the benefits to children, should respond to the incentives from greater competition by improving student performance. The fact that the private schools receive public funds should not mitigate this expectation, from the standpoint of this theory, and in fact, was specifically recognized in the proposals recommended by Chubb and

Moe (1988, p. 1085). Private schools should, according to pro-market neo-institutional theorists, respond to competition by increasing the performance of the students they serve.[2]

On the other hand, if as Smith and Meier (1995) have countered that the preponderance of evidence shows that public schools have performed well in the face of changing demographics and social pressures, the children from private schools should do no worse, but also no better than those from public schools. Also, weighing in on the side of null expectations would be the argument that the public schools currently have few incentives to improve performance. Competition changes the incentives faced by public school teachers and administrators and therefore, may cause them to improve student outcomes. However, competition is the component of the causal package in the latter argument that motivates improvement.

To separate out these arguments, tests of mediation and of moderation are needed. If children who attend private schools are responsible for any observed benefits of competition, then adding an indicator of private sector schooling in the model will test the relative responsiveness of public versus private schools. If the effects of competition change when the indicator of private school attendance is added to the model, the type of school attended is mediating the effects of competition, according to the test of mediation proposed by Baron and Kenny (1986). Three theoretically interesting outcomes are possible:

[2] While pro-market neo-institutional theorists, predict greater responsiveness among private schools, other theorists have assumed that schools, whether public or private have little direct effect on student achievement and analyzed performance impacts as dependent on each student's own ability and the ability of their peers (Epple and Romano 1998). Their models show that achievement gains result from a more efficient reallocation of students by ability level and that vouchers allow more high-ability, low income students to receive benefits from high-ability peers.

- If competition was originally significant and remains so and the private school indicator is significant, it indicates that competition affects public schools, but to a lesser extent than private schools.
- If competition was originally significant and becomes insignificant while the private school indicator is significant, then the effects of competition were due entirely to private school attendance.
- If competition was originally insignificant, but when the private school indicator added, it and the competition variable are significant, then private students outperform public school students and the sectors are responding differently to competition.

A test of moderation will allow us to examine if public schools and private school respond differently to differences in competition. The Chubb and Moe neo-institutional theory would expect private school performance to increase more in competitive markets because these schools are unencumbered by political controls and district bureaucratic hierarchies. Those who posit that lack of incentives are the source of poor public school performance would expect the responses to be equal and therefore the slopes on the term that interacts private schools and competition to be insignificant.

Finally, we consider another paired hypothesis - counter hypothesis that focus on the impacts of competition on stratification. In a recent review of the literature about school choice, Teske and Schneider (2001) conclude this way: “the central issue that requires much more careful study is linking stratification to specific forms of choice” (p. 625). A prominent assumption behind the neo-institutional theory of competition is that parents will act rationally and seek out schools that will produce better outcomes and that the outcomes that parents seek align with outcomes that society values and benefits from, such as higher levels of skills, more educational attainment, and higher wages. Smith and Meier, state the counter argument in this way: “competition will promote elitism and de facto segregation” (1995, p. 42). Some initial

evidence from studies of school choice supports this counter-hypothesis. Schneider and Buckley (2003) find that parents seeking information about schooling choices on the Web did not focus their search on performance, thereby reducing the possibility that they were seeking better outcomes. These parents were more likely to seek out information on demographics, perhaps suggesting that more homogenous groupings were a higher priority than better student outcomes or that the two were related, perhaps based on peer effects. In studies of child care choice, where there is more competition and choice, parents seem to place more emphasis on convenience, warmth of the teacher, and cost than quality of the program or credentials of the teacher (Cryer and Burchinal 1997; Bradbard, Endsley, and Readdick, 1983; Johansen, Leibowitz, and Waite 1996).

However, the assumption that *all* parents must act rationally in choosing their children's school is relaxed in a study by Schneider, et al. (1998) that shows that "marginal" consumers can cause the markets to respond in ways that benefit all consumers. Marginal consumers according to Schneider, et al. are those parents who visit more than one school in the process of deciding where their child will attend. These consumers ask questions during their interactions with school personnel that orient the personnel toward the preferences of these parents. After learning about the parents' preferences, schools adopt practices consistent with them and orient themselves to performance criteria set by these parents. In the end, Schneider, et al. conclude that marginal consumers produced positive externalities which result in improved performance in all schools (1998, p. 790). However, they did not test for the possibility that market segmentation resulted in much higher than average benefits for the children of better-off parents, the group who made up the marginal consumers, and that children of parents who were less active and less well-off received much lower than average benefits. If the externality theory of the marginal consumer holds, improved performance from competition should be relatively equal and spread relatively evenly across families from varying educational and economic backgrounds.

In summary, the pro-market, neo-institutional theory that relates competition to educational performance has three testable hypotheses which will be examined in this study:

1. Competitive markets for students will produce higher levels of student performance than less competitive markets;
2. Private schools, which have greater autonomy in responding to incentives for improved performance will outperform public schools in competitive environments and the performance of private schools will be better in more competitive environments when compared with less competitive environments;
3. Competition will improve student performance across educational and economic strata.

In the next section, we describe the institutional arrangements and data that will allow us to test these hypotheses.

3. A Test of Neo-institutional Theories of Competition on Educational Outcomes

When the existing institutional arrangements enjoy a near monopoly, as is the case with the linkage between public school funding and direct control of public schools, tests of the impacts of alternative institutional arrangements can be nearly impossible to arrange. In such situations, political scientists have turned to new institutions or to other countries to test their theories, perhaps best exemplified by Putnam's (1993) test of the effects of social capital on the performance of recently instituted regional governments in Italy. To find tests of competition, researchers who turned to other countries, often cannot obtain data on individual children that can offer controls for family background or deal with endogeneity of the putative "causal" variable (Mizala and Romaguaera, 2000) or they lack objective measures of the most theoretically relevant measures (Ladd and Fiske, 2003).

To find institutional arrangements that allow for a test of the neo-institutional theories of competition, we turn to an educational reform to establish an earlier grade, prekindergarten, that is being pursued at least to some extent in 42 states (Education Week, 2002), which we will

refer to as universal prekindergarten (UPK). These UPK programs are based on a number of studies that developmentally oriented preschool can increase children's language and cognitive development (Consortium for Longitudinal Studies, 1973), and produce other longer term benefits such as reduced retention rates, fewer special education assignments and higher graduation rates (Barnett, 1992; 1994; Reynolds, 2000; Reynolds et al., 2001; Conyers, Reynolds, and Ou, 2003). Moreover, state expenditures on prekindergarten have been associated with higher scores on the National Assessment of Educational Performance (Grissmer, et al., 2000). While some of the nine states that fund full day prekindergarten (Pre-K) on the regular school calendar have coupled public funding to direct administration by local public schools, Georgia's UPK program allows parents to choose the prekindergarten for their four-year-olds from numerous private and public organizations that are approved to receive state funding. Serving over 50 percent of the eligible four-year-olds, Georgia's Pre-K program is the most comprehensive in the nation.

Georgia's Pre-K program offers subsidized, full day, site-based instruction and supervision for 180 days per year for four-year-old children whose parents choose to enroll them. The Georgia program allows parents to choose between approved public schools providers and private organizations, including religious organizations, to provide tuition free Pre-K services for their children. Parents can choose to cross attendance zones established by local school districts and to cross district boundaries to enroll their children in public schools other than their neighborhood school. These new institutional arrangements offer the opportunity to test the advantages of competition without the problem of selection bias created by a neighborhood school.

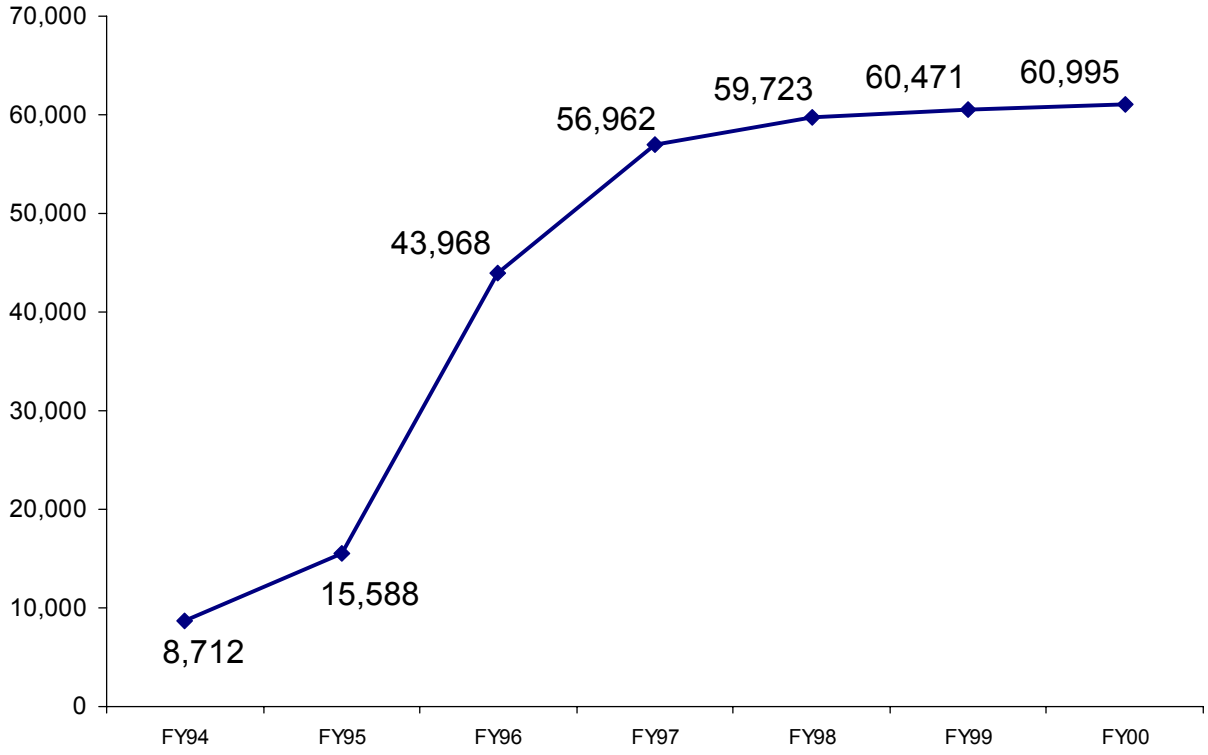
A. Program Characteristics

Funded by the Georgia Lottery, the Georgia Pre-K program began as a means tested program in the 1993-94 school year.[3] Beginning with the 1995-96 academic year, Georgia became the only state to offer full-day, fully-subsidized, voluntary Pre-K for all four-year-olds regardless of household means. In 1996-97, the program served over 57,000 four-year olds, and in 1999-2000, the program served 60,995 children (See Figure 1), an estimated 53.5 percent of the eligible population, at a cost of $216.3M. The program is administered at the state level but the providers may be local public school systems, not-for-profit organizations, or private for-profit firms, where each provider must receive approval from the state's Office of School Readiness (OSR) to offer one or more Pre-K classrooms. Providers complete an application and compete to provide a Pre-K class. In some counties, the public school provides all of the Pre-K slots and in other counties private centers (for and not-for profit) provide all of the slots. In most counties there is a mix of providers. Children may attend Pre-K at any of the providers at no tuition cost to the child's family. Currently, there are 3,152 classrooms across the state participating in the program. Private-for-profit providers offer the largest number of classes (1,460), but are closely followed by local public school systems (1,325), which together offer 88 percent of the classrooms. Not-for-profit providers include Head Start agencies (40 classes) and non-sectarian entities operating within faith-based organizations provide most of the remaining slots (Office of School Readiness, 2000).[4]

[3] Unless otherwise indicated, the particular information about Georgia's Pre-K program presented in this section can be found in Henry, Gordon, Henderson and Ponder (2003).

[4] Religious activities are not permitted in Pre-K programs that receive funding from the state of Georgia through Georgia's Pre-K program.

Figure 1: Number of Children Served by Georgia UPK



In addition to typical health, safety, and nutritional regulations, OSR regulates instructional services including teacher credentials and curriculum. Teachers must have specific educational credentials to qualify as lead teachers. Each classroom is authorized to enroll up to 20 students and must have a lead teacher and teacher's aide in the classroom whenever the children are present. Smaller classes are permitted, but funding is pro-rated based on the number of students enrolled and classes may be closed if less than 16 students are enrolled. Instruction must be based on an approved curriculum such as Creative, High Reach, High/Scope, and Montessori or providers who wish to utilize an alternative curriculum can submit them for approval. OSR also provides technical assistance to Pre-K teachers and administrators and provides grants to the classrooms to purchase materials and equipment.

In exchange for a flat payment per student from OSR, providers must agree to offer full-day services (at least 6.5 hours) that follow the local school calendar (180 days per year). However, the flat payment, which averages approximately $3,400 per student, varies slightly based on input levels. For example, payments for students in a classroom with a teacher certified in early childhood education are greater than payments for students who have a lead teacher with a high school degree and Child Development Associate. In addition, there are small transportation subsidies for providing transportation to children classified as economically disadvantaged.

Pre-K centers that participate in the Georgia Pre-K program may recruit but not discriminate in the selection of children for Pre-K spaces. If there is excess demand for a particular Pre-K center, then the center must conduct a fair (lottery or similar) process to determine which children are admitted. Parents cannot be charged additional fees for the basic service (six and one-half hours of Pre-K), but those requiring early morning, late afternoon, or summer care as well as additional services (music, dance, or foreign language, for instance) can be charged additional fees, which are not regulated by the state.

The Pre-K market in Georgia differs substantially from the K-12 education market in two important respects. These differences lead to greater parental choice in Pre-K, and thus greater competition for four-year-olds to attend. First, Georgia parents may send their four-year old to any state-approved private Pre-K. Pre-K classes operated by local school systems cannot be compelled to take children who reside in other school districts, but may take them if space permits. All children within a school district have equal access to all public school classes in that district irrespective of whether the selected school is the child's neighborhood school. In many cases, parents can choose to have their four-year-olds close to their workplace rather than home or to have their child attend pre-k in the preschool or child care center that they attended before pre-k rather than their neighborhood school. Second, the private sector in the Georgia Pre-K market is large; over one-half of the eligible Pre-K slots are in the private sector.

Evidence of the greater competition in the Pre-K market comes from the number of locations—currently there are 1,127 public elementary schools, which compares with 1,680 publicly funded Pre-K centers statewide. Even though less than 60 percent of Georgia four year olds are enrolled in Pre-K, collectively parents of four-year-olds have over 500 more tuition-free choices for Pre-K than they will have for kindergarten. This program structure offers a unique environment to test some of the issues that have arisen in the debates over school choice and the effects of competition.

B. Sample Characteristics

With funding and support from Georgia's Office of School Readiness, the state agency that manages the Pre-K program, researchers began a longitudinal study of 3,639 students enrolled in the Georgia Prekindergarten program during the 1996-97 academic year.[5] The researchers selected 203 Pre-K centers using a stratified probability sampling procedure from the list of all approved Pre-K classes. All parents and students from the chosen classes were recruited into the study. This sampling design means that the study results are generalizable to the state's Pre-K population. As shown in Table 1, over 3,000 children remained in the study through their fourth year of elementary education.

Table 1: Status of Original Sample of Children Status for 2000-2001

Children Located	3,001
Deceased, Refusals	17
Moved Out-of-State	201

[5] To account for missing data common to survey research, NORM (Schafer, 2000) was used to impute missing values using a multiple imputation algorithm using all available data (see also, King, Honaker, Joseph & Scheve, 2001; Schafer, 1997; Schafer, 2002).

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Home-schooled	19
Unknown	401
Total	**3,639**

C. Measures and Analysis Used in the Study

1. Student Outcomes

Effects on student outcomes are estimated for four variables. The first outcome variable is retention. Retention is an indicator of whether in Georgia's official enrollment count in the fall of any school year indicated that student was enrolled in a class that was behind her/his expected grade level. We estimate that 12.3 percent of the 1996-97 study participants were retained at some point prior to the fourth grade.[6] Retention is a particularly important variable since it has been shown to predict future school failures, specifically, dropping out before obtaining a high school degree (Alexander and Entwisle 1996). Since retention is a dichotomous variable, probit was used to estimate the retention models.[7]

The effects of competition on standardized test scores in language arts and math of the children are analyzed. The children who were in the third grade in 2000-2001 were tested using the Stanford 9 as a part of the Georgia statewide assessment program. Therefore, there are scores for 1,991 children (66 percent of the children still in the study) for whom a test score was matched with their identification information. Approximately, 550 children who attended third grade in 2000-2001 were not able to be matched with test scores, some of whom: missed school during the testing period; were excluded from testing by their Individualized Education

[6] Some children may have been retained more than once.

[7] In all cases, the estimates were developed using design weights to correct for the probability of selection and cluster effects from selecting children from within the same classes. The largest design effect attributed to clustering indicated that the standard errors were inflated by 9 percent, but the average effect was less than 5 percent.

Plans, or were not matched for other reasons. Since the test scores are for children who were not retained, the average test scores are likely to be higher than what would be found for the whole sample. To account for the bias introduced by only using test scores of the on-grade children, an inverse Mills ratio, the hazard that a child would not take the standardized test was estimated and included in the model. Appendix A details the modeling.

Finally, we analyzed children's overall readiness for school during their primary years. Primary school readiness is an average of end of year ratings completed by teachers for all five years of the study for the child's perceived readiness for the next grade.[8] All of the ratings were completed by the child's teacher using an identical seven-point rating scale. Teacher ratings are important because they may capture children's social and behavioral skills that are not assessed by standardized achievement tests. In addition, teachers may choose to group children according to their perceptions of the children's readiness or to allocate resources differentially on this basis. All standardized test score data and teacher ratings were estimated using OLS, but with adjustments for the potential for endogeneity of competition and the probability of attending Pre-K that is provided by a private organization for equations in which private school attendance was included. The adjustments are outlined below.

2. Measure of Competition

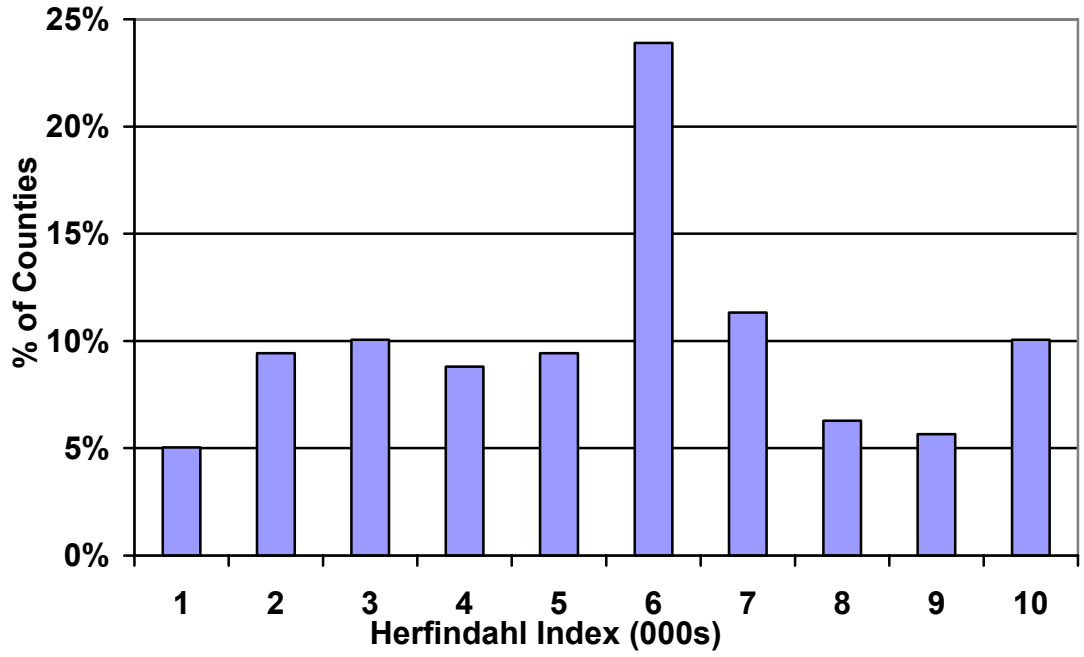
Competition is measured by the Herfindahl Index, which measures the extent to which organizations compete to provide goods or services, in this case educational services, within a defined market. The Herfindahl Index is an economic measure of competition determined by the formula $\sum_{1}^{n} i^2$ where *i* is the percentage of the market share held by one organization (in this case a school), squared and summed across all of the firms in the market, in this case a county.

[8] Kindergarten readiness ratings were analyzed separately but the results did not markedly differ from primary school readiness ratings.

If one organization, in this case likely to be a local school district, supplies all of the available slots the Herfindahl Index would be 10.0 ($\sum_{1}^{1} 100^2$).[9] If 25 providers supplied an equal number of slots the Herfindahl Index would be 0.04 ($\sum_{1}^{25} 4^2$). Economists generally consider scores below 1 to indicate a competitive market, scores between 1 and 2 to indicate a monopolistic competitive market, scores between 2 and 6 to indicate an oligopolistic market and scores above 6 to indicate a monopolistic market. Figure 2 displays the Pre-K market conditions for each county in Georgia. To control for county-level effects that may affect both the competitiveness of the county and student outcomes (endogeneity), the estimates from a first stage model predicting the Herfindahl Index was used as the measure of county-level competitiveness in the outcome models. Appendix B details the first stage equation that was used to obtain the predicted level of the Herfindahl Index for the estimates of the effects of competition on student outcomes.

[9] Some researchers measure the Herfindahl Index on a 0-1 scale or a 0-10,000 scale. The results herein measure the Index on a 1-10 scale where we divided the Index by 1000.

Figure 2: **Distribution of Herfindahl Index**



3. Control Variables

In addition to information from teachers and administrative data, trained interviewers collected a wide array of information about the demographics and family characteristics of each child. We developed a composite measure of the family characteristics that place children at risk for future school failure and other negative social consequences. The composite was based on a number of factors as shown in Table 2, including participation in means-tested federal programs at any time during the study period, household income, parental education, and living in the same residence since attending Pre-K. Based on these characteristics, the Bayesian probability of being in a category was estimated for each child using a latent class analysis. Risk category 1 (Risk 1) are the children most at-risk with low income, high participation in means tested programs, lower parental education. The Bayesian probability score for Risk 1, the children most at-risk, was used in all of the analyses. Risk 2 indicates children with less risk; these children are from lower income and less educated families but generally only qualify for health-related, means tested federal benefits. The higher the Risk 1 or

Risk 2 probabilities, the greater are the potential risks for later school failure. Risk 3 children have moderate income and education levels and receive some federal subsidies. Risk 4 children are the least at risk; these parents are generally well-educated and have higher incomes.[10] The higher the Risk 3 or Risk 4 probabilities, the lesser are the potential risks for later school failure. To test the stratification hypothesis, risk categories 1, 2 and 4 were interacted with the Herfindahl Index. For a complete discussion of the demographic factors that impact student outcomes, see Appendix C.

Table 2: Family Factors related to Risk of School Failure

Risk Factors	Risk 1	Risk 2	Risk 3	Risk 4
Teen Mom	64.3%	41.1%	23.7%	4.5%
Welfare/TANF	51.1	0.4	4.3	0.0
Food Stamps	79.3	2.5	7.5	0.0
WIC	50.0	10.1	9.0	1.6
Health Benefits	90.4	21.3	14.6	0.0
Parental Drug Use	2.2	1.6	1.6	2.8
First Language Not English	1.9	7.4	2.3	5.6
Transitional/Subsidized Housing	7.4	1.7	0.6	0.0
Child has Fair to Poor Health	5.3	2.1	2.1	1.0
Child has Disability	19.8	12.9	12.0	12.3
Fear of Crime	20.5	14.3	8.9	6.7
Low Income	100.0	100.0	0.0	2.8
Moderate Income	0.0	0.0	74.3	42.0
Moderate High Income	0.0	0.0	20.0	38.6
High Income	0.0	0.0	5.7	16.6
Family Receives Means Tested Ben.	87.0	72.7	37.5	21.3
Less than High School	20.0	6.1	1.5	0.0
High School	41.1	38.4	18.6	0.0
Some College	27.4	32.2	30.5	0.0
BA	8.1	16.1	37.3	0.0
Some Grad. School	1.5	4.6	10.1	0.0
Grad. School	1.9	2.6	2.0	100.0

Note: Percentages are the percent of each risk grouping that has the specified risk factor.

[10] The risk categories were developed from the data collected over the five year study. Some parents received some benefits while their child was in Pre-K, and later reported having high incomes.

Table 3 contains summary statistics for variables used to estimate effects of competition on student outcomes.

Table 3: Variables in Model

Variable	Description	N	Mean	Std dev.
Retention	Indicator if child was retained at any point	3526	0.123	0.328
Math Test Scores	3rd Grade Stanford 9 Test Scores (only children on grade level)	1991	46.25	19.63
Language Arts Test Scores	3rd Grade Stanford 9 Test Scores (only children on grade level)	1991	47.76	21.01
Behavioral Ratings	Average of Behavioral Ratings across 5 years	3636	4.75	0.94
Communication Ratings	Average of Communication Ratings across 5 years	3636	4.85	0.90
Readiness Ratings	Average of Readiness Ratings across 5 years	3537	5.04	1.27
P(Risk 1)	Bayesian Probability of High Risk	3516	0.156	0.270
Age	Age of Child at Entry to Pre-K	3380	4.487	0.299
Sex (Male = 1)	Sex indicator	3459	0.499	0.500
Black	Race indicator	3321	0.398	0.490
Other Race	Race indicator	3321	0.092	0.288
Total Slots	Total Pre-K and Head Start Slots in County	3639	69.84	16.35
Private Slot %	Private Slots/Total Slots *100	3639	35.87	26.62
LSS Slot %	Local School System Slots/Total Slots *100	3639	48.47	29.50
Herfindahl Index	Indicator of market competitiveness	3639	2.58	2.24
Teacher Experience	Pre-K Teachers' Years of Teaching Experience	3074	4.16	4.80
Other Credential	Indicator that Pre-K teacher either had a college degree, Montessori certificate, etc.	3508	0.790	0.407

CDA/CCP	Pre-K teacher completed a CDA/CCP program	3508	0.104	0.305
Teacher- High School Grad.	Pre-K Teacher education	3111	0.133	0.340
Teacher- Grad. School	Pre-K Teacher education	3111	0.106	0.308
Inverse Mills Ratio	See Appendix A. Inverse of predicted probability of retention.	2457	1.75	0.38

4. Attending a private preschool

The Pre-K program provides a wide range of options for parents, including attending a public school, a private for-profit school, a religious school; or a Head Start or other non-profit school. In order to test our corollary hypothesis that private schools will outperform public schools, we measured the school choices as a binary choice, with public school's as the omitted category and all other school types collapsed into a private category. Since parent choice may be correlated with the outcome variables, we developed a probit model (see Appendix C) to generate the predicted probability that a child will attend a private school. The factors that we included in the probability model were family and child characteristics (age, sex, race, risk factors) and county-level characteristics (population size, racial composition, child race X racial composition, available private slots as a percentage of available total slots). The predicted probability of attending a private school is the independent variable used to test the hypothesis.

IV. Findings

A. Competition leads to better student outcomes

The primary hypothesis being tested in this study is whether competition for students leads to better student outcomes. Higher levels of competition (lower levels of the Herfindahl Index) reduce retention and increase test scores in language arts and math (Table 4). Greater competition within a county is also associated with higher readiness scores, but the relationship

is statistically insignificant. To give a sense of the magnitude of the effects of competition, increasing competition by one standard deviation (2 points on a 10 point scale), is expected to be associated with a 1.4 percentage point decrease in retention, and increases of 2.0 and 1.4 percentile points on language arts and math test scores, respectively. The test score effect size is roughly .10. The magnitude of the effect is modest, but the overall effect could mask larger effects that are anticipated by the second and third hypotheses.

The remaining coefficients are largely in line with findings of prior research. Older children were less likely to be retained and were judged by their teachers to more ready for their next grade. Boys are more likely to have been retained, do worse in language arts, and are judged less ready than girls. African-American children were no more or less likely to be retained than White children after controlling for family risk, but do less well on the standardized assessments and readiness measures. Other minorities, principally Hispanic children in this study, score less well in their language arts assessments than White children but did not perform better or worse on the other measures.

Table 4 **The Effects of Competition on Student Outcomes**

	Retention Marginal Mean Standard Error	Language Arts Coefficient Standard Error	Math Coefficient Standard Error	Readiness Coefficient Standard Error
Prob. of Risk 1	0.108**	-13.242**	-11.156**	-0.875**
	0.019	1.687	1.628	0.090
Age	-0.124**	2.351	1.870	0.525**
	0.020	1.635	1.558	0.076
Sex (Male = 1)	0.045**	-5.599**	-0.706	-0.389**
	0.011	0.955	0.902	0.044
Race1 (African American = 1)	0.018	-8.802**	-8.421**	-0.204**
	0.012	0.989	0.934	0.047
Race2 (Other Non-White = 1)	0.015	-3.954*	-2.203	-0.045
	0.023	1.916	1.794	0.082
Predicted	0.007*	-1.042**	-0.715**	-0.020

Herfindahl Index	0.003	0.246	0.230	0.011
Mills Ratio	[redacted]	-3.977* 1.897	-5.556** 1.872	[redacted]
Constant/Probability	0.112 ---	59.420** 1.521	55.683** 1.448	5.458** 0.036
R^2	---	0.11	0.08	0.09
N	3639	1991	1991	3537

Overall, these findings support the expectations of neo-institutional theorists that competition will improve the educational outcomes of children, but the benefits are modest. The benefits are greatest for language arts test scores, math test scores and reducing retention. The broadest but most subjective of the measures of children's outcomes in this study, primary school readiness does not appear to be significantly affected by increased competition.

B. Private schools will respond to competition to a greater extent than public schools

The pro-market theory of competition holds that bureaucratic rules and red tape restrain public school personnel from responding to incentives for better performance, therefore, private schools which are relatively unconstrained by these rules are expected to outperform public schools. Further, if private schools are responsive to pressures to compete in socially productive ways, the private schools in competitive environments should out-perform those in less competitive environments. To fully explore these interrelated hypotheses, two variables must be added to the model that was used to test the primary hypothesis. First, a variable which indicates whether the child attended a private school and second, a variable that interacted private school attendance with the Herfindahl Index was needed. The second variable allows the slopes for both public and private to vary, enabling us to test different response patterns to changes in competition. However, to first address the issue of complete mediation, we specify equations that test the extent to which private schools completely or partially mediate the effects of competition.

Results, presented in Table 5, suggest that institution type does not mediate the effects on performance. The positive effects of competition on test scores are slightly reduced (language arts) or statistically eliminated when private school attendance is included in the equations. After controlling for private school attendance, greater competition is associated with larger reductions in retention and, for the first time, competition is associated with increased school readiness. Contrary to the pro-market hypothesis, private school attendance increases retention and lowers readiness ratings. While the effect of private school attendance on retention is statistically insignificant, as are its effects on test scores, because of the multi-collinearity in the model, we conducted a test of joint significance (adjusted Wald test), which confirms that the Herfindahl Index and private school attendance are jointly significant in all four equations.

Table 5 **The Effects of Competition and Private School Attendance on Student Outcomes**

	Retention Marginal Mean Standard Error	Language Arts Coefficient Standard Error	Math Coefficient Standard Error	Readiness Coefficient Standard Error
Prob. of Risk 1	0.111**	-13.201**	-10.838**	-0.902**
	0.019	1.714	1.651	0.091
Age	-0.123**	2.434	2.045	0.516**
	0.020	1.634	1.560	0.076
Sex (Male = 1)	0.045**	-5.606**	-0.739	-0.385**
	0.011	0.957	0.902	0.043
Race1 (Black = 1)	0.019	-8.760**	-8.177**	-0.223**
	0.012	1.015	0.959	0.048
Race2 (Other Non-White = 1)	0.019	-3.890	-1.682	-0.078
	0.024	1.994	1.867	0.084
Predicted Herfindahl Index	0.010**	-0.968**	-0.359	-0.048**
	0.005	0.368	0.337	0.018
Predicted Prob. Private (1 = Private)	0.021	0.450	2.845	-0.210*
	0.030	2.305	2.154	0.108
Mills Ratio	[redacted]	-3.360	-5.040*	[redacted]

	[redacted]	2.075	1.985	[redacted]
Constant/Probability	0.112	59.021**	55.268**	5.470**
		1.620	1.513	0.036
R^2	---	0.11	0.08	0.09
N	3639	1991	1991	3537
Adj. Wald Test- Joint Significance of Predicted Herfindahl Index and Predicted Private				
F	3.40	8.19	5.06	3.51
Df	(3, 3443)	(3, 1799)	(3, 1799)	(3, 3341)
P<	0.0336	0.0003	0.0065	0.0300

To test the possibility of differential responses of private and public schools to competition, we specified equations that allow a test of moderation (Baron and Kenny 1986). The overall results strongly supported that the effects of competition are moderated by the type of school attended, although not entirely in the fashion predicted by the neo-institutional theorists (Table 6). The positive and significant direct effects of competition on test scores and retention were reduced in magnitude and rendered no longer statistically significant when private school attendance and the interaction between private school attendance and competition were included in the equations. However, school readiness is now positively and significantly affected by greater levels of competition. While the theoretically interesting coefficients are only sporadically significant when tested individually, the adjusted Wald test established their joint significance, leading to the conclusion that at least some of the individual tests of significance are biased because of inflated standard errors arising from multi-collinearity. To aid in the interpretation of the combined effects, we present four figures (Figure 3 – 6), to illustrate the responses by sector to differing levels of competition. The graphs were calculated for African-American girls from high risk families who began preschool at 4.5 years of age. The Figures are centered at the mean level of competition (2.59), plus or minus one standard deviation. This choice affects the level (y intercept) of the estimates that are graphed but not the rate of response of the sector to competition.

Table 6 The Effects of Competition and Test of Moderation of Effects by Type of School Attended

	Retention Marginal Mean Standard Error	Language Arts Coefficient Standard Error	Math Coefficient Standard Error	Readiness Coefficient Standard Error
Prob. of Risk 1	0.108**	-13.083**	-10.771**	-0.915**
	0.019	1.726	1.662	0.091
Age	-0.124**	2.420	1.960	0.511**
	0.020	1.633	1.564	0.076
Sex (Male = 1)	0.045**	-5.612**	-0.743	-0.384**
	0.011	0.957	0.902	0.043
Race1 (Black = 1)	0.019	-8.735**	-8.127**	-0.225**
	0.012	1.014	0.957	0.048
Race2 (Other Non-White = 1)	0.019	-3.732	-1.549	-0.078
	0.025	1.997	1.868	0.084
Predicted Herfindahl Index	0.003	-0.814	-0.341	-0.077**
	0.006	0.473	0.442	0.023
Predicted Prob. Private (1 = Private)	0.019	1.006	3.400	-0.206
	0.029	2.362	2.208	0.108
Pred. Private * Predicted Index	0.018	-0.390	0.080	0.083*
	0.010	0.825	0.767	0.037
Mills Ratio	[redacted]	-4.284*	-5.906**	[redacted]
		1.960	1.951	
Constant/Probability	0.111	59.399**	55.816**	5.518**
	---	1.522	1.453	0.042
R^2	---	0.11	0.09	0.09
N	3639	1991	1991	3537
Adj. Wald Test- Predicted Index, Predicted Private, Predicted Index*Predicted Private				
F	3.36	6.17	3.90	3.65
Df	(3, 3442)	(3, 1798)	(3, 1798)	(3, 3340)
P<	0.0181	0.0004	0.0087	0.0121

The patterns observed in the figures can be summarized as follows:

Retention (Figure 3) – Private schools appear to respond to increasing competition by lowering retention rates by approximately 7 percentage points for every one standard deviation change in the Herfindahl Index. Public schools were estimated to have lower retention rates than private schools in low competition environments, but the rates were estimated to be comparable in higher competition areas.

Language Arts Test Scores (Figure 4) – Both public and private schools appear to substantially raise test scores in counties with greater competition, but private schools were estimated to increase language arts test scores (approximately 2.5 percentile points for one standard deviation change in competition) more than public schools (approximately 1.5 percentile points for one standard deviation change in competition) in more competitive areas. In less competitive areas, the differences were not estimated to be substantial or significant.

Math Test Scores (Figure 5) – Public schools and private schools appeared to respond in nearly the same way to competition in terms of math test scores, with both adding slightly less than one percentile point for one standard deviation change in the Herfindahl Index. However, private school students, after adjusting for selection and family characteristics, maintained a consistent advantage of more than three percentile points in math test scores over public school students.

School Readiness Ratings (Figure 6) – Public schools appeared to respond to competition in ways that produced higher overall school readiness rating by primary school teachers. In less competitive counties, public and private students (high risk, African-American females) received comparable ratings of about 4.2 on a seven-point scale where 4 is average. The same public school student in a county that was one-standard deviation more competitive would have received a 0.2 increase in their rating.

Both public and private schools appeared to react in ways to competition that increased the outcomes of their students. For private school students, their benefits were in test scores and in lower retention rates. For public school students, their outcomes were increased in test scores and overall ratings of school readiness. Cumulatively, the results do not support the neo-institutional hypotheses that public schools which are embedded in organizational hierarchies are constrained in responding to the incentive of competition.

Figure 3: Effects of Competion on Retention Rates for Children Attending Public or Private Preschools

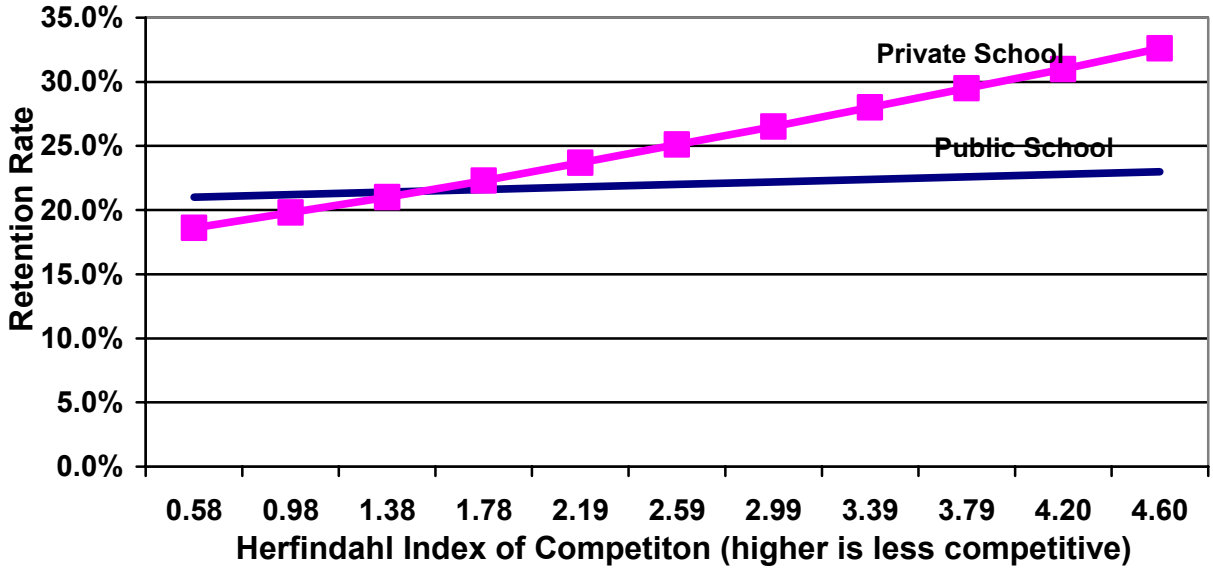


Figure 4: Effects of Competition on Language Arts Scores for Children Attending Public or Private Preschools

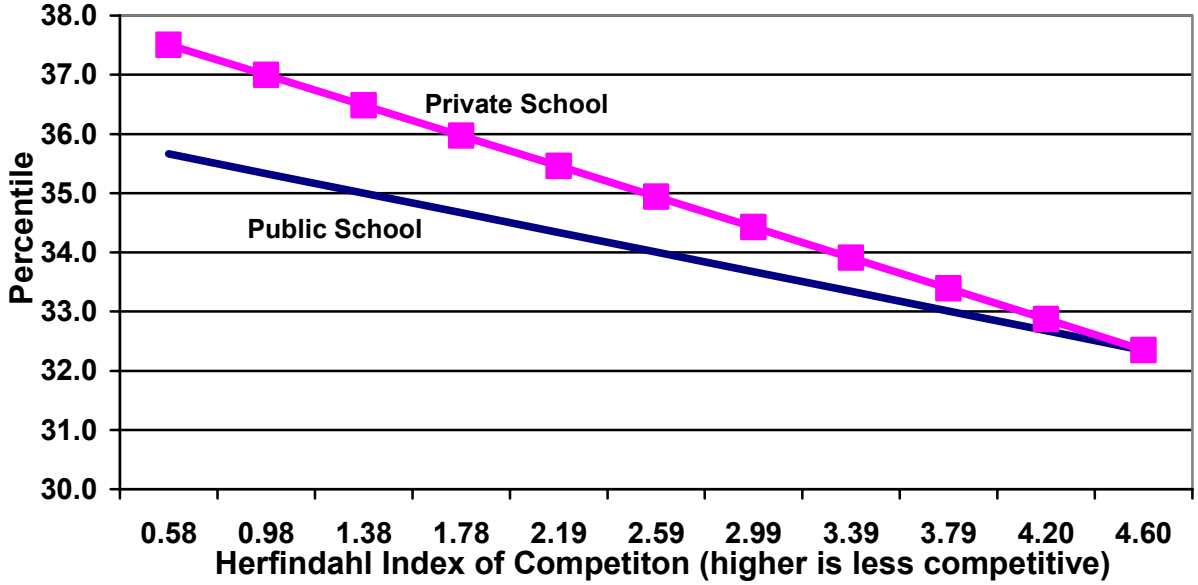


Figure 5: Effects of Competition on Math Scores for Children Attending Public or Private Preschools

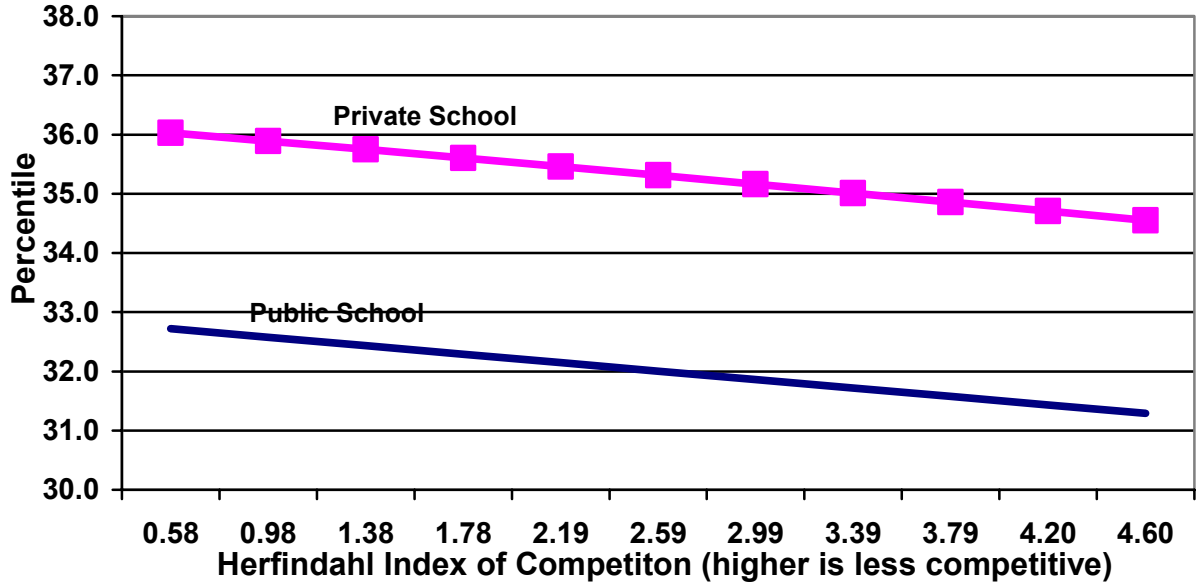
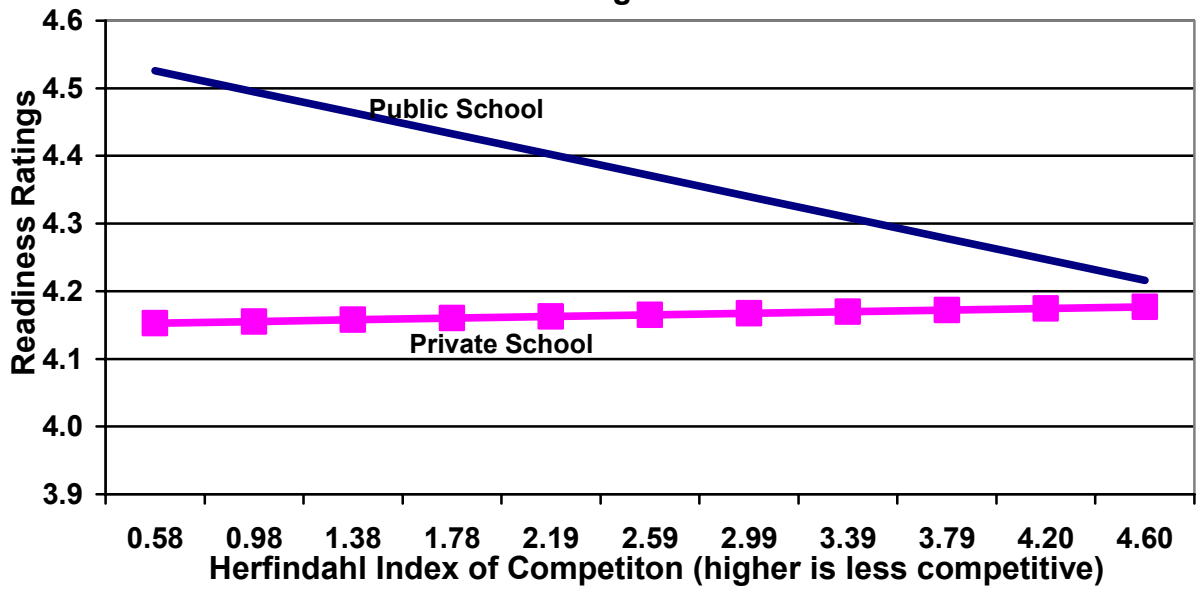


Figure 6: Effects of Competition on Teachers' Ratings of Readiness for Children Attending Public v Private Preschools



C. Competition increases the performance of students across economic and social lines

Pro-market neo-institutional theorists hold that competition between schools will benefit all children based on the assumption that parents will act rationally to maximize the gains to their children's skills and abilities or at least enough parents will become rational consumers such that positive externalities are produced for all children. We tested this hypothesis by including three risk related variables in the equations and an interaction term representing the effects of competition on children from each of the three risk categories. We include variables for children most at-risk, children moderately at-risk, and children not at-risk, leaving children with low risks out of the model. All variables are the estimated probability of membership in that risk category. The model including interaction terms allows us to examine the extent to which the effects of competition are similar across all risk groups or vary.

The effect of competition on the omitted group, children with low risks, is indicated by the coefficients on the predicted Herfindahl Index. Competition reduces the retention rates for these children. The retention rates for children moderately at-risk were reduced, but insignificantly. While the retention rates were 20 percentage points higher for the children most at-risk than the children not at-risk, retention rates increased for both these groups when competition increased (Figure 7). For the test scores and readiness rating, the four groups retained their expected ordering across varying levels of competition and the tests of significance provide little evidence that competition better served children of families with the greatest advantages (and perhaps, greatest time and inclination to shop for schools). Nor were the children from families with greatest risk more poorly served by greater competition. The pro-market neo-institutional theory of competition is supported by this evidence.

Table 7 **Estimates of the Moderated Effects of Risk on the Relationship between Competition and Educational Outcomes**

	Retention Marginal Mean	Language Arts Coefficient	Math Coefficient	Readiness Coefficient

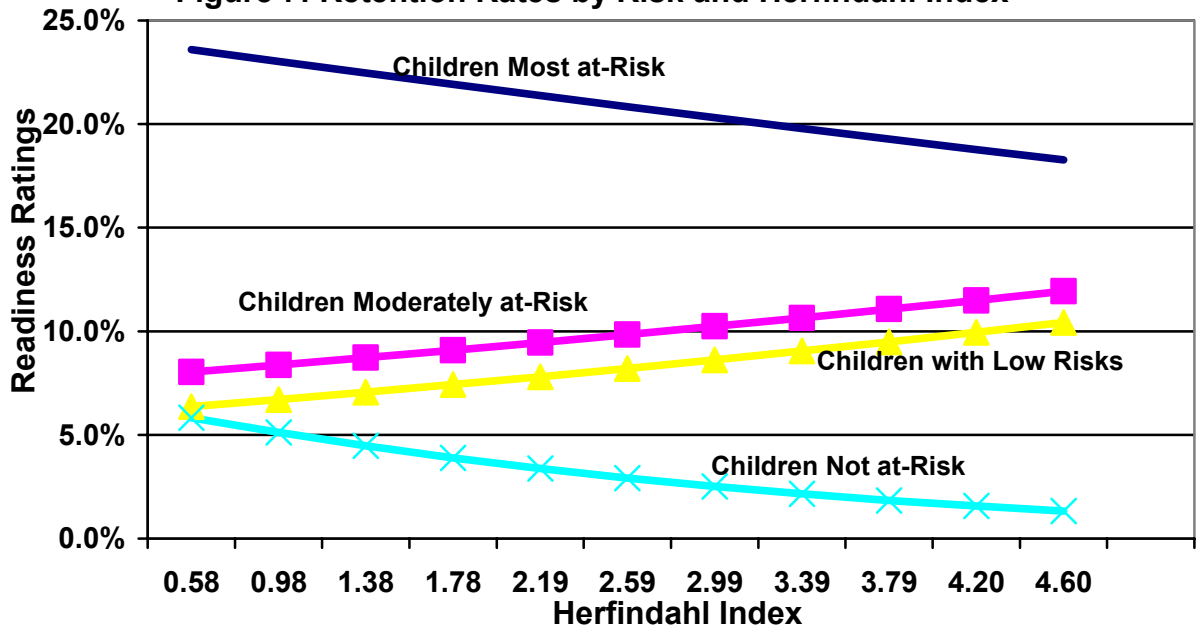
	Standard Error	Standard Error	Standard Error	Standard Error
Prob. of Risk 1	0.108**	-10.188**	-8.916**	-0.792**
	0.020	1.767	1.636	0.096
Risk 1* Predicted	-0.021*	-1.610	-0.877	-0.000
Herfindahl Index	0.009	0.831	0.807	0.041
Prob. of Risk 2	0.019	-5.227**	-4.266**	-0.216**
	0.018	1.475	1.330	0.070
Risk 2* Predicted	-0.002	0.808	0.422	-0.006
Herfindahl Index	0.008	0.636	0.630	0.033
Prob. of Risk 4	-0.094**	9.236**	8.447**	0.426**
	0.026	1.538	1.465	0.067
Risk 4* Predicted	-0.043**	-0.940	-0.817	0.008
Herfindahl Index	0.012	0.795	0.762	0.034
Predicted	0.012**	-0.716	-0.437	-0.008
Herfindahl Index	0.004	0.373	0.354	0.017
Age	-0.123**	2.417	2.027	0.539**
	0.020	1.617	1.539	0.076
Sex (Male = 1)	0.043**	-5.265	-0.401	-0.383**
	0.011	0.914	0.890	0.043
Race1 (Black = 1)	0.012	-7.477**	-7.267**	-0.158**
	0.012	0.995	0.944	0.047
Race2 (Other Non-	0.013	-3.115	-1.451	-0.012
White = 1)	0.23	1.888	1.760	0.082
Mills Ratio	[redacted]	-4.993**	-6.374**	[redacted]
		1.860	1.862	
Constant/Probability	0.109	58.974	55.171**	5.421**
	---	1.615	1.546	0.042
R^2	---	0.14	0.11	0.10
N	3639	1991	1991	3537
Adj. Wald Test- Prob(Risk1), Predicted Index, Pred. Index * Prob(Risk1)				
F	13.35	20.35	13.85	26.74
df	(3, 3442)	(3, 1798)	(3, 1798)	(3, 3340)
P<	0.0001	0.0001	0.0001	0.0001
Adj. Wald Test- Prob(Risk2), Predicted Index, Pred. Index * Prob(Risk2)				
F	4.96	5.15	3.90	3.70

df	(3, 3442)	(3, 1798)	(3, 1798)	(3, 3340)
P<	0.0019	0.0015	0.0001	0.0113

Adj. Wald Test- Prob(Risk4), Predicted Index, Pred. Index * Prob(Risk4)

F	7.62	17.71	13.54	13.65
df	(3, 3442)	(3, 1798)	(3, 1798)	(3, 3340)
P<	0.0001	0.0001	0.0001	0.0001

Figure 7: Retention Rates by Risk and Herfindahl Index



V. Conclusions

We set forth three hypotheses derived from the neo-institutional theory of the benefits of competition for providing educational services. The primary hypothesis was that competition would produce better outcomes for students, which was largely supported by significant associations between greater competition and improved educational outcomes for three out of the four outcomes included in the study. However, the magnitudes of the gains associated with competition were relatively modest. However, contrary to the second hypothesis drawn from neo-institutional theories of market controls, public schools appeared to respond to the incentives of competition in a manner similar to the private providers, but on different outcomes. Private schools were estimated to have a competitive advantage on test scores in language arts

and, in even more substantial fashion in math, while public schools appeared to have lower retention rates and higher primary school readiness ratings. Finally, only on one outcome variable, retention, were children from families with high levels of risk poorly served by competition.

The analyses in this paper do not shed light on the overall benefits of universal pre-k. Other studies have supported that prekindergarten is an effective educational reform strategy (Grissmer, et al., 2000) and that it can increase the readiness of children for kindergarten (Henry et al. 2003). This study indicates that governments that are in the process of establishing universal pre-k programs may extract greater benefits for children by choosing market solutions that permit private organizations and public schools to compete to provide preschool education by decoupling the provision of pre-k from the funding for pre-k. However, the responsiveness of public schools suggests that they should be included in the competition to provide these services. Including public schools expands the choices available to parents and, based on these results, may allow them to pursue outcomes that may benefit their children most.

The magnitude of the benefits of competition, particularly in the moderated model, strongly suggests that more competition could raise educational performance. Benefits were modest in the model that tested the overall effects of competition, which should not be ignored, since many other attempts at reform have not produced measurable benefits. But the magnitude of the benefits must be put into the appropriate context. This study reports on benefits four years after the children attended preschool where competition was an incentive. The effects from one year of schooling in a competitive market appear to have persisted for four years. Moreover, the effort expended by the parents for one year of schooling, may be much less than they would have expended in shopping for a school that would serve their children for several years. If the children had been educated for all five years in schools responding to

competitive incentives, the effects may have been much larger, although this study does not have evidence to support or deny this possibility.

Other reforms, most notably high stakes accountability systems (Loeb and Carnoy 2003; Raymond and Hanushek 2003) seem to be associated with benefits, at least on test scores, and apparently provide incentives for public schools to produce higher levels of performance. Competition to educate young children may add to the increased outcomes, especially in light of the fact that accountability systems seldom extend below grade three. School administrators and teachers in the early primary grades are less likely to respond to incentives from accountability systems but may respond to parents if they are given incentives to do so.

However, because the benefits of competition may be difficult to arrange in sparsely populated counties and even some entire states, reforms such as accountability systems may motivate more comprehensive change than market reforms can accomplish. However, in urban areas, where educational performance has lagged and progress seems intractable, competition may be an extremely viable reform option for states to pursue in expanding the reach of accountability reforms into lower grades.

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Appendix A

Table A.1	Predicted Probability Taking Standardized Test Marginal Mean Standard Error
	-0.304***
	0.026
Retention	
	-0.007
	0.037
Probability (Risk1)	
	0.064**
Probability (Risk2)	0.029
Age	-0.016
	0.032
Sex (Male = 1)	0.000
	0.019
	-0.020
Race1 (Black = 1)	0.023
Race2 (Other Non-White = 1)	-0.070*
	0.036
	0.112**
PreK Teacher CDA or CCP	0.044
	-0.067
PreK Teacher High School Degree	0.043
	-0.149***
PreK Teacher Graduate Degree	0.031
	0.046***
Communication Rating	0.011
	0.102
	0.074
Borders Tennessee	
	0.067
	0.050
Borders Florida	
	-0.153***
	0.046
Gross Digest Per Capita Income	-0.005

	0.005
	0.140***
	0.028
Transfer Payments	
	-0.017***
High School Graduation Rate	0.004
	0.000
College Graduation Rate	0.004
	-0.003**
	0.001
Work in County	
	0.006
Average Commute Time	0.006
	-0.089***
	0.027
Area	
	-0.251**
	0.100
Black Population	
	0.298**
	0.062
Mileage	
	-0.004***
	0.001
School Enrollment	
	-0.004***
	0.002
Growth Rate	
	0.000
Capital Expenditures	0.000
Constant/Probability	0.536
R^2	---
N	3639
F(30,3415)	16.37
P <	0.001

Inverse Mill's Ratio: $e^{(-.5*phat^2)/(\sqrt{2\pi}*\Phi(phat))}$

Appendix B

Table B.1
Herfindahl Index Equation

	Coefficients Std. Errors
Per Capita Income	-0.245*** 0.011
Transfer Payments	0.382*** 0.052
High School Grad. Rate	-138.926*** 8.648
College Grad. Rate	49.658*** 6.399
Unemployment Rate	-108.109*** 16.785
Work in County	-32.696*** 2.208
Commute Time	-206.887*** 12.199
Area	-663.196*** 38.876
Black Population	5093.067*** 315.772
Hispanic Population	-18348.220*** 1505.721
Medicaid	-10864.460*** 1094.986
Food Stamps	32932.080*** 2484.374
TANF	-149211.500*** 13806.510
General Revenue	768.550*** 279.486

Growth Rate	-23.315***
	2.776
Capital Expenditures	0.211***
	0.045
Women Labor Force	-454.681***
	20.111
Constant	2586.502***
	16.226
R^2	0.81
N	3639
F(17,3621)	902.86
P <	0.001

Appendix C

Table C.1	Predicted Probability of Attending Private School
	Marginal Mean Standard Error
Age	-0.065* 0.037
Sex (Male = 1)	0.036* 0.021
Race1 (Black = 1)	0.083* 0.050
% of County Identifying as Black	0.642*** 0.059
Interaction (Black * % Black)	-0.489*** 0.141
Population of County (000s)	-0.120*** 0.010
Race2 (Other Non-White = 1)	-0.198*** 0.038
Private Slots	0.019*** 0.000
Probability (Risk1)	-0.098*** 0.038
Probability (Risk2)	-0.058* 0.037
Probability (Risk4)	0.029 0.041
Constant/Probability	0.592
R^2	---
N	3639
F(11,3434)	625.12
P <	0.001