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11

THE COMPETITIVE EFFECTS OF CHARTER SCHOOLS ON TRADITIONAL PUBLIC SCHOOLS

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Charter schools are arguably one of the most important public school reforms in the last quarter century. Charter schools are public schools that are exempted from much of a given state's education code, so that they can more freely innovate with respect to the teachers they hire, the curriculum that they teach, and teaching methods. One rationale for charter schools is that heterogeneous students have different needs, implying that a one-size-fits-all approach to public education will fall short of the ideal of individualizing the education given to each child. Charter schools are often seen as a way of providing parents with greater control over both the curriculum and the pedagogical methods to which their children will be exposed. This rationale for charter schools envisages charter schools as improving public education primarily for those students who opt for charter schools.

A second view of charter schools is that, in addition to improving outcomes for those students who choose to enroll, charter schools provide a competitive spur to traditional public schools. The essence of the argument is simple: traditional public schools do not want to lose their students to charter schools, for fear of cutbacks or outright closure. Teachers, principals, and district administrators therefore react to increased competition for students by examining what

parents are seeking in a school, and then implementing reforms in the traditional public schools to emulate the most popular of the charter schools.

In this way, the argument goes, the quality of traditional public schools becomes higher than it would be in the absence of this competition. Given the current reality that in most districts charter schools account for far less than half of enrollment, the competitive effects of charter schools could benefit a majority of students in a district, while the direct effects of charter schools on enrollees benefit the small minority of students who enroll in charter schools. Conversely, it seems likely that the direct effects on individual charter attendees will be stronger than the possibly diffuse effects of competition on individual students in the traditional public schools.

The goal of this chapter is to explore the theoretical implications of this theory of choice, and then to offer a balanced appraisal of the empirical literature on whether charter schools induce a competitive effect among traditional public schools. The empirical literature is clearly in its infancy, so this chapter will devote at least as much attention to a mapping out of strengths and weaknesses of existing research--and potential new--approaches as it will to evaluating the existing evidence itself.

Insights from Economic Theory on Charters and Competition

Betts (2005) provides an overview of the theory of competition in education markets, and what policy decisions can enhance the degree of competition in the market for schooling. Rather than repeating that analysis, this section will discuss the school characteristics that parents are likely seeking, and what the ramifications are for empirical studies of charter schools and their competitive effects.

A typical economic model begins by hypothesizing that individuals--or, in the present case, families--have well defined preferences that can be expressed as a utility function, that is, a mathematical function describing well-being. Economists usually model an individual's utility as a function of current and future consumption and leisure. For families, the utility function might

include the present welfare not only of parents but of children and, if parents are forward-looking, the welfare of their children once they have grown up. Thus, for instance, present and future streams of consumption and leisure of both parents and children in a family could be the most important components of a family's utility function.

At first, such a representation of family "happiness" or "utility" might seem rather restrictive. How does a child's education fit into any of these compartments? Most directly, the years of schooling and the quality of schooling that a child receives should affect the child's set of skills. This skill set should directly affect the child's employability and wages later in life, and therefore should affect the child's future consumption. Thus, if parents care about the future consumption of their children, they should seek out schools that teach valuable skills, and that encourage students to study hard, to graduate from high school, and to go on to postsecondary education.

There are less direct ways in which children's education could affect their future well-being. Schools that nurture in their students an appreciation for things like civic values, a clean environment, and the arts, could fundamentally alter and improve the ways in which students, as adults, will use their leisure time. Parents could care deeply about such aspects of schools. The implication is that charter schools, if they emphasize these goals, could encourage nearby traditional public schools to increase their own emphasis on teaching these values.

It seems obvious, once stated, that parents should care not just about test scores but about adult outcomes of their children such as earnings and non-financial measures of welfare such as values. But it seems quite difficult to design research to address these latter questions. In this light, it is hardly surprising that virtually all of the empirical work on charter schools' competitive effects focuses on the effects on test scores. Test scores provide one measure of students' achievement and skill. Research has also shown that test scores of students are positively correlated with earnings later in life, although not as strongly as some might think. (Griliches &

Mason, 1972, provide one of the earliest examples of this relation. For more recent evidence see for example Murnane, Willett and Levy, 1995.) Accordingly, most of what follows here will focus on charter schools and achievement as measured by test scores. But the chapter will later return to the idea that the research community ultimately will need to expand its set of outcome measures considerably. Examples of outcomes that could be examined quite readily now include safety at school, and how students' civic values evolve over time. As charter schools produce more and more graduates, longer term outcomes such as high school graduation, college enrollment, earnings, unemployment and criminal records provide other examples.

Three key assumptions underlie the hypothesis that charter schools will force traditional public schools to improve student achievement: 1) Charter schools do compete in terms of academic quality; 2) Parents (and their children) display a strong preference for high academic quality when choosing schools; and 3) Administrators in districts whose traditional public schools are losing students to charter schools respond to the competition by seeking to improve the academic quality of those schools.

There exist numerous ways in which this chain of causation could break down. Charter schools may in fact not offer academically superior educational environments, at least on average, either because they pursue other goals, or do not receive sufficient funding to compete academically. Second, parents may either not be able to recognize academic quality, or they may not care strongly about it. Third, school districts may not respond in the anticipated fashion. For instance, the outflows of students to charter schools may be too small in most districts to elicit a response. Alternatively, district administrators may not understand what aspects of charter schools attract parents, and so fail to compete along dimensions that they cannot perceive. Yet another possibility is that district administrators do recognize how they must improve the academic quality of traditional public schools, but lack the finances or the power to implement change. After all, administrators of public school districts face myriad constraints on their actions,

including the limits imposed by collective bargaining agreements with unions, state law and regulations governing public education, and rules on how and when the district must spend money that comes from state or federal sources.

Empirical Approaches to Testing for Competitive Effect of Charters on Student Achievement in Traditional Public Schools

To date, authors have adopted one of three methods when studying effects on achievement.

Method 1: Geographic Proximity as a Gauge of Within-District Competition

The first method is to count the number of charter schools within a given distance of each traditional public school in a district, and to use this or a variant as the measure of charter competition facing each traditional public school. The underlying assumption here is that charter schools that are relatively close to the traditional school impose far greater competitive pressure to improve than do charter schools that are further away.

Several difficulties threaten the validity of this approach.

Endogenous Location of Charter Schools. The first difficulty is that, in the parlance of economists, the location of charter schools may be "endogenous." If charter school operators actively choose where to open their schools as a function of neighborhood and school characteristics that might directly influence the achievement of students in the local traditional schools, then we cannot obtain an unbiased estimate of the effects of charters on nearby traditional public schools.

For example, suppose that some unobserved variable directly affected the achievement of students in local traditional public schools. Perhaps it becomes known that a certain principal is doing a poor job, but that for whatever reason the district does not intervene. Charter school operators might be particularly likely to open a school nearby because they know that parents at

that school are probably disenchanted with their traditional neighborhood school and inclined to leave.

This "endogenous" decision by the charter operator to open a school nearby creates a spurious negative correlation between achievement at that traditional public school and its proximity to the charter. A simple cross-sectional analysis of the correlation in a given year between test scores at traditional public schools and proximity to a charter school would suggest that proximity to a charter school "causes" test scores to be lower at traditional public schools. In reality, poor leadership at the traditional public school has caused both the low test scores and the establishment of a charter school nearby.

Although in theory endogeneity bias could work in either direction, it seems likely that it would understate the degree to which proximity to a charter school boosts student achievement at traditional public schools.

One partial solution to this problem would be for researchers to move from using a cross-section (a single snapshot in time) to a panel data set in which they have repeated observations over several years of both test scores in traditional public schools and the location of charter schools. Researchers could then perform a "before-after" analysis which asks: "After a charter school opens up, does achievement improve at nearby traditional public schools?" This panel approach reduces the risk of endogeneity bias: if a weak principal induces a charter to open up nearby, we should expect there to be no spurious correlation between *changes* in achievement at that school and *changes* in the presence of a charter school nearby.

However, such methods are not perfect. Suppose that when a particularly ineffective principal arrives at a traditional public school, it sets off a crescendo of problems that leads to test scores that decline each year, but at an accelerating rate. In such a case, changes in test scores at that school would become increasingly negative, and we still might incorrectly attribute the worsening situation to the endogenous arrival of the charter school.

A second method for handling the endogenous location is to use instrumental variables (IV), also known as Two Stage Least Squares. In the IV approach, researchers look for a variable that can predict whether a charter school opens up locally but that does not directly affect test scores at traditional public schools. If such a variable can be found, it can be used to predict the location of charter schools. The researcher then estimates the effect of predicted (rather than actual) proximity of charter schools on test scores in traditional schools. Such methods produce unbiased estimates of the causal effect of charter proximity on academic outcomes at traditional public schools only if the instrumental variable does *not* directly influence test scores at the traditional public schools.

Composition bias. A potential weakness of the proximity method is that researchers may fail to capture movements of students between the traditional public schools and charter schools. For instance, if researchers have access only to data on average achievement by school, and if the charter school mainly attracts the high-achieving students from traditional public schools, it will appear as if the arrival of a charter school lowers student achievement at nearby traditional public schools. Conversely, if charters mainly attract below-average students, then the arrival of a charter school will be correlated with a rise in average achievement at nearby traditional public schools. In both cases, competition may be misinterpreted as the cause of these changes in average achievement, when really they merely reflect the unrepresentative characteristics of students who opt to leave for charters.

A simple fix for this problem is to avoid measuring achievement at the school level and instead to measure it at the student level. Ideally, researchers will have repeated observations on each student in the district, so they can model gains in individual students' achievement before and after a charter school arrives in the neighborhood. (Even better, researchers can purge their models of unobserved ability and motivation, to the degree that these things are unchanging for individual students over time, by including a student fixed effect in their models.)

Does Geographic Proximity Adequately Capture Charter Schools' Attendance Area?

The method of measuring geographic proximity of a charter school as a proxy for competition makes sense only to the degree that charter schools draw from the local attendance area of the nearest school. In cases in which the researcher instead uses a proxy such as "Is there any charter school within five miles?" the same criticism applies, but obviously more weakly. To see why the integrity of the "proximity" method is at risk, consider the following admittedly extreme case. Suppose that there is a single charter school in a district, and that this charter school draws an equal percentage of students away from all of the traditional public schools in that district. Presumably, then, this charter school will create identical degrees of competitive pressure on every traditional public school in the district. But if we model gains in achievement at each traditional public school as a function of whether it was within 5 miles of the charter school, we would estimate an effect of zero, precisely because the competitive pressures exerted by this charter school will be the same regardless of distance. In less extreme scenarios, the charter school may well exert greater competitive pressures on nearby schools than those that are further away. In this case a regression that controls for presence of a charter within five miles would probably yield a positive coefficient, but it would again be biased toward zero.

We have very limited evidence on just how widely or narrowly charter schools cast their nets. Bifulco and Ladd (2006) observe student transfers in North Carolina and find that roughly 90 percent of students who switch into charter schools come from traditional public schools within 10 miles. Schools within 0-5 miles lost the greatest share of students, but schools within a variety of ranges up to 10 miles all lost significantly more students than did the comparison group, traditional public schools more than 20 miles away from the given charter school.

In a study of school choice in San Diego, Betts, Rice, Zau and Koedel (2006) report on a survey they conducted of charter school administrators in San Diego in 2004. They find that on average charter schools in San Diego draw only 39.7% of their students from the local attendance

area. (Naturally, this figure is much higher in charter schools that have converted from being traditional public schools, and much lower among startups. The respective numbers for conversion and startup charter schools are 68.3% and 30.2%.) The implication is that charter schools in San Diego draw students from around the district, and thus we could expect competitive pressures to spread far beyond the traditional public school in the same attendance zone as the charter school. This result is rather remarkable given that San Diego, compared to New York or Chicago, has both relatively low population density and sparse provision of public transportation systems. One could imagine that distance matters even less in more densely populated cities with good subway and bus systems.

Method 2: Whole-District Comparisons

The second method is to compare overall achievement patterns among districts, testing whether relative trends in test scores are correlated with the share of enrollment accounted for by charter schools in each district.

Although this approach avoids the problem that charter schools endogenously choose where to locate within a district, the use of an indicator for competition at the district level creates a new form of potential endogeneity. Are there unobserved changes in districts that begin to grant charters that could account for the changes in productivity? Suppose for instance that an unusually effective new superintendent simultaneously implements professional development for teachers (or some other unmeasured intervention that boosts achievement) and approves the startup of several charters. Such events would create a spurious positive correlation between charter schools' enrollment share and student performance at traditional public schools.

This method, unless it follows the academic progress of individual students, is also subject to the same composition bias described early in regards to proximity studies.

Method 3: Examining Charter School Penetration on a School-bySchool Basis, and the Potential for More Complex Methods

A rather direct way to measure the competitive pressures that individual traditional public schools actually experience is to calculate how many students each of these schools has lost to charter schools. If competitive effects exist, then we would expect that schools that have lost the most students to charters should have improved the most. If researchers can observe school switches over time then they are in a perfect position to use this approach.

Such analysis can be likened to a "black box" analysis because it does not attempt to explain what aspects of charter schools attract students previously attending traditional public schools. A more nuanced analysis could explore why certain traditional public schools lose more students to charters than other schools. In this approach, which has yet to be carried out in the literature, one would search for the dimensions of school quality that matter to consumers (families). One would then examine the dimensions in which charter schools appear to have an advantage, and infer which traditional public schools are likely to be losing enrollment, or market share, to charters because the former schools perform poorly relatively to the charters in those dimensions. Finally, one could test whether schools facing more pressure, based on the traits of each traditional public and charter school in the district, indeed improve more academically over time.

The hardest part of this more complex approach would be to estimate what parents are looking for in a school. One approach is to estimate statistically families' preferences based on their actual choices. A second approach is to survey families. For example, if parents in a given neighborhood appear, based on surveys, to place the greatest priority on schools that promote good civic values and a safe environment, and to place almost no weight on how far away the schools might be, then two charter schools across town that excel in both of these domains might provide huge competitive pressure on the traditional public school in the local neighborhood. Researchers could then predict the degree of competitive pressure on a traditional public school by measuring how closely charter schools in the district match the preferences of parents in that

neighborhood. This predicted measure of competition could then be used to predict gains in achievement at each traditional public school.

General Equilibrium and Non-Linear Effects: Twin Threats to All Methods

At present, in most districts nationwide charter schools enroll a minority, and usually a small minority, of the district's student population. Therefore, existing studies of the competitive effects of charter schools cannot claim to reveal how traditional public schools would react if, instead of losing 1%, 5% or even 10% of their students, they instead began to lose 20%, 40% or 60% of their students to charter schools.

Should we expect a linear response by traditional public schools to increased charter competition, or is there a tipping point beyond which responses become much stronger? It seems reasonable to argue that major reforms involve large fixed costs (that is, one-time costs that do not depend upon enrollment) such as staff time needed to diagnose problems, to draw up a plan, and then to secure the funds and personnel needed to implement the plan. A school may decide that the costs of reform outweigh the benefits if the school has lost only a few of its students to charter schools in the area. Thus, the existing literature could understate greatly the *potential* competitive effects of charter schools on student achievement in traditional public schools.

A second problem that affects each of the research approaches outlined above ignores what economists refer to as general equilibrium effects. Many policy analyses done by social scientists either implicitly or explicitly use partial equilibrium analysis, meaning that they focus on just the market most directly affected by a certain policy, while disregarding side effects on other markets. It is at least as common for policy analysts not even to model partial equilibrium in the sense that they do not consider how expanding the supply for a certain type of service or worker could affect the price of that service or worker. Closely related to this tendency to focus on partial equilibrium is a tendency of policy analyses to ignore potential non-linear effects as programs scale up.

A simple example illustrates. Suppose a demonstration program in New York City randomly assigns 50 high school dropouts to either a program in which they train to become plumbers, or a control group that receives no training. After two years, researchers note that workers in the control group have seen their annual earnings stay constant at about $25,000 per year, while those randomly selected for the plumbing program see their earnings rise from $25,000 to $70,000 on average. Excited by the huge personal returns to this training, government leaders then spend millions of dollars to train every high school dropout in New York to become a plumber.

It is easy to predict that when this program is scaled up, the average gains in earnings will be far less than in the small-scale study of 50 workers. The scaled-up program will create a huge oversupply of plumbers, driving down plumbers' wages, let's say, to $50,000. At the same time, high school dropouts would be attracted by the high wages plumbers typically earn, and leave occupations such as taxi driver, restaurant worker and so on in droves. Shortages of applicants in these occupations will drive up wages from, say, $25,000 to $35,000. So instead of a gap in earnings between those high school dropouts who do not enter the plumbing program and those who do of $70,000-$25,000=$45,000, we might see a gap of only $50,000-$35,000 = $15,000. Trainees receive far smaller benefits than created by the small-scale trial. High school dropouts who do not receive the training benefit because wages rise in low-skill occupations. People who had worked as plumbers before this training program lose a lot because the flood of new plumbers lowers their wages; New Yorkers with plugged drains benefit because plumbers now command lower wages. None of these cascading effects was apparent when the training program operated on a small scale.

One might assume similar unintended general equilibrium effects arising if charter schools grew far beyond their current low market shares of enrollment because of the effects on the market for teachers. Hoxby (2002) uses surveys of teachers in both charter schools and

traditional public schools and concludes in part that charters attract into the teaching profession people who would not otherwise have considered teaching. Suppose that this continues to apply as the charter movement expands. It implies an increase in the supply of teachers in the given district. Given a fixed number of students, we infer that salaries for teachers might fall somewhat, especially in the traditional public schools that are losing students. This could alter the composition of the pool of teachers in traditional public schools, perhaps in a negative way. This would dampen the competitive effects of charters.

In addition, general equilibrium effects might not alter the true competitive effects of charters, but could bias researchers' estimates of the effects. Here is a quite plausible example. Suppose that one district in a city became known both for its outstanding charters and its much improved traditional public schools (resulting from genuine competitive effects). Many parents might now prefer to move to this district. The parents who could afford to move typically would have higher than average income. Noting the well-established positive correlation between family income and student achievement, we could anticipate that the influx of parents would increase test scores at traditional public schools in the district. This would lead to an upwardly biased estimate of the competitive effects of charters.

To take this general equilibrium argument one step further, the influx of families to the district would raise both rents and house prices, which in turn would predictably induce lower-income families to leave, raising average test scores in traditional public schools in the district yet further, and biasing naïve estimates of competitive effects further upwards.

The good news is that by employing longitudinal methods that follow individual students over time, researchers could reduce the distortions caused by movements of families into and out of a district. The reason why longitudinal data is so valuable in this context is simple: by following individual students over time we can test whether a specific school really is improving.

Simpler approaches, such as measuring average test scores each year, are highly vulnerable to changes in the student composition of the school.

More challenging is the issue of non-linear competitive responses. We may not know whether this is a problem until school choice programs ramp up considerably. With these caveats in mind, we now turn to the evidence.

What Does The Empirical Evidence Suggest?

Studies Based on Geographic Proximity

The vast majority of studies on charter schools and competitiveness have used geographic proximity as a measure of competition. Given the large number of potential confounding issues in these studies, this section will focus mainly on those conducted in Florida, North Carolina and Texas that use data and methods most likely to minimize the impact of the potential empirical problems. After discussing these studies in some detail, the section will outline more briefly some of the other studies, which come from California, Michigan, and Milwaukee.

Sass (2006) analyses the competitive effects of charters using student-level data in Florida. He uses panel data on individual students, thus reducing the possibilities of compositional bias. Also, in recognition of the possibility that charters might locate near low-performing traditional public schools, Sass controls for school (interacted with student) fixed effects to minimize downward bias resulting from the endogenous location of charter schools. Another hallmark of this work is that it controls for potential competition from private schools and other traditional public schools. Each model accounts for either the presence of each of these three types of competitors within radii of 2.5, 5 and 10 miles, or instead counts the actual number of schools of each type. A third specification instead uses the market (enrollment) share of charters within each of these three distances. Results are highly similar across these specifications.

Sass finds evidence that the presence of charter schools within radii of 2.5 and 5 miles, but not 10 miles, is associated with stronger gains in math for students in traditional public schools. The effects are moderate. For example the presence of a charter within 2.5 miles is associated with greater gains in math achievement on the order of 3 percent of the average annual gains in math scores, while the presence of a charter within 5 files is associated with gains that are roughly 2 percent. In contrast, the presence of private schools and traditional public schools only occasionally enters significantly, and with varying signs. Charters typically have no significant effect on reading achievement gains. (In the market-share specification, the market share of charters within 10 miles has a weakly significant and positive effect on both reading and math scores, but market share within the smaller radii has no effect.)

A recent study of North Carolina charter schools by Bifulco and Ladd (2006) studies the question of competition using methods very similar to those of Sass (2006). Notably, Bifulco and Ladd show that inclusion of fixed effects for schools (interacted with student fixed effects) indeed reduces bias related to the location of charter schools near low-performing traditional public schools. They show that when student fixed effects are used, without school fixed effects, the estimates of the competitive effects are much lower, and presumably biased down. This is an important insight to remember given other papers that have not controlled for unobserved characteristics of each traditional public school.

Bifulco and Ladd model the gains in individual students' achievement as a function of binary variables indicating the presence of at least one charter school within 2.5, 2.5-5 and 5-10 miles, restricting this analysis to those attending traditional public schools. The authors do not find evidence that the presence of charter schools boosts achievement growth for students in traditional public schools. The results are similar when the authors instead model test scores as a function of the number of charter schools within five miles. Buttressing their conclusion that charters do not induce competitive responses in North Carolina, the authors also show that those

who switch to charters in that state do not improve their reading or math gains, and that in fact, their gains appear to be smaller after switching.

Earlier work in North Carolina at the school level by Holmes, DeSimone and Rupp (2003) obtained much more positive effects of charter proximity on achievement in traditional public schools, but the method in this latter paper is not as rigorous as the method adopted by Bifulco and Ladd (2006).

Buddin and Zimmer (2005) perform a similar analysis using data from six districts in California. Their measures, included one at a time in separate models, are distance to the nearest charter school, a dummy variable for the presence of any charter school within 2.5 miles, the number of charters within 2.5 miles and the enrollment shares of charters within 2.5 miles. Another distinguishing feature of this work is that it measures competition related to both charter and magnet schools. The authors find little evidence that increases in competition are associated with gains in achievement for individual students in regular public schools. One potential issue is the aforementioned survey by Betts, Rice, Zau and Koedel (2006) suggesting that in one the districts of study, San Diego, charter schools reported attracting only a small share of their enrollment from the local attendance area.

Buddin and Zimmer (2005) also conduct a statewide survey of principals at regular public schools in California, and find that typically 80 to 90 percent of respondents reported that the presence of charter schools in their district has "no effect" on various measures such as "ability to attract and recruit students," "financial security," or "teacher recruitment and retention."

Strikingly, however, 11.6% of principals who report that charters operate locally indicate that "the school or the district has changed instructional practices in response to the introduction of charter schools." In some ways this is a disproportionately large effect. In the 2001-2002 school year in which the survey was done, charters accounted for 2.2% of enrollment statewide (see Zimmer et al., 2003:2). The survey results suggest that for every charter enrollee, there are

perhaps five students in traditional public schools where school policies have changed to respond to the competition.

Using data from Michigan, Bettinger (2005) also models student achievement at regular public schools as a function of proximity to charter schools. This paper more directly accounts for the possibly endogenous location of charter schools. It does this by instrumenting for the number of charter schools within 5 miles using the presence of universities that in Michigan are allowed to issue charters. He also uses as an additional instrument a measure of racial diversity given the evidence by Glomm, Harris and Lo (2005) that charters are more likely to operate in racially diverse districts. The dependent variables are average math and reading scores in grade 4 in 1998-1999 at each traditional public school, and thus the results are subject to composition bias if charter schools do not attract a representative set of students from surrounding schools. This work does not find any competitive effects from the number of charter schools in the local area. (The coefficients are suggestive of positive competitive effects, but they are not statistically significant.)

This paper provides the most ingenious method for solving the potentially endogenous location of charter schools, by using instrumental variables. However, the short time frame, in which each traditional public school's test score in 1998-1999 is modeled as a function of its own test scores in 1996-1997 and the instrumented level of the number of nearby charters, compounded by the lack of modeling at the student level, raise concerns.

Greene and Forster (2002) study school-level test score changes in grades 4, 8, and 10 in Milwaukee between the 1996-1997 and 2000-2001 school years as a function of the distance to the nearest three charter schools and a measure of private school competition. The authors do not specify which subject areas their test scores include. In grades 4 and 8, they find no evidence of a charter competition effect, but in grade 10 gains in test scores are higher in traditional public schools with charters within 1 or 5 kilometers. Because the dependent variable is a school

average, and the models include only rudimentary controls for student demographics and no school fixed effects, it is unclear whether the association is a causal one.

In each of these studies, it is important to note the time frame and the charter school share of enrollment in each of these states. Sass (2006) studies student achievement up to the 2002-2003 school year, by which time charter school enrollment had reached 2.1% of all enrollment in Florida. In contrast, Bifulco and Ladd's (2006) study in North Carolina goes up to 2001-2002, by which time charter schools' enrollment share had reached only 1.4% of enrollment. Additionally, North Carolina's law enabling charter schools set a strict cap of 100 charter schools statewide (Bifulco & Ladd, 2006). It is possible that administrators at traditional public schools in that state viewed charter schools as a permanently insignificant type of competition.[1] In California, the Buddin and Zimmer (2005) study also looks at competitive effects in a relatively early stage of the charter school movement in that state, from spring 1998 through spring 2002, by which year charter schools' share of enrollment in the six districts studied rose from 1.9% to 4.3%. Bettinger (2005) cites Michigan's charter school share as 3% by 1999, the year used for his study.

Two Studies Based on School-by-School Comparisons of Charter Penetration

Booker, Gilpatric, Gronberg, and Jansen (2004) study the competitive effects of charter schools in Texas. This is the first paper to use a school-level penetration measure, calculated as the cumulative outflow of students from a traditional public school to charter schools, minus the cumulative inflow to that traditional public school of students formerly enrolled at charter schools, expressed as a percentage of the students who had attended that school. The authors find that gains in school-level charter penetration are associated with positive changes in test scores at the traditional public school. In reading and math, gains in students' test scores are predicted to rise by 0.01 and 0.02 of one standard deviation (of the levels of test scores in Texas) for each one percent increase in charter penetration. These effects are per year, so the cumulative effects could become quite large over time. The systematic and statistically significant findings that

competition matters are made more impressive by the fact that only 5-6 of 1,041 Texas districts had charter penetration above zero, and in these cases, the enrollment share of charters was on average very small, around 1 or 2%. At the same time, these low penetration percentages beg the question of what might happen in Texas if charters became much more widespread.

Buddin and Zimmer's aforementioned (2005) study of charter schools in six California districts uses as one of various measures of charter competition "the local traditional public school's percentage of students switching to a nearby charter or other school in the previous year." This variable does not become significant in any of the regressions. It would be useful to supplement this possibly noisy explanatory variable with the cumulative number of students lost to charters over time, as in the Texas study by Booker, Gilpatric, Gronberg, and Jansen (2004).

Studies Based on Whole-District Comparisons

A quite different approach to the question is to use the overall enrollment share of charter schools in a district as a proxy for competitive effects. Hoxby (2003) introduced this technique, performing a difference-in-difference regression to test for a link between the level of school productivity, measured by test scores divided by spending per pupil, and an indicator for whether charter schools account for 6% or more of local enrollment. The results based on school-level data from Michigan uniformly support the idea that increased competition increases "productivity" measured in terms of grade 4 and 7 math and reading scores. The results weaken somewhat when the dependent variable is instead "*changes* in productivity", a specification which accounts for different trends across schools. In this latter, and more convincing, specification, estimated effects are about one fifth or less as big and are significant only at the 10% level for grade 4, and statistically insignificant for the models of grade 7 reading and math gains. In separate specifications that model test scores rather than test scores divided by spending per pupil, exactly the same patterns of significance obtain. That is, levels of math and reading test scores are significantly higher in both grades 4 and 7 in districts that start to face charter competition, but

when gains in test scores are instead modeled, these competitive effects appear only for grade 4 and not grade 7.

In these latter models of gains in test scores, districts that begin to experience charter competition amounting to at least 6% of enrollment, one-time gains in reading and math are estimated to be 0.13 and 0.16 of a standard deviation in test scores in grade 4. These gains are fairly sizeable. In grade 7, where the effects are not significant, the effect sizes are also much smaller, at 0.01 and 0.06 respectively.

Similar results are found using data from Arizona. In the more convincing models that take into account the possibility of differences in gains in achievement among schools, the coefficient on the dummy for charter competition is positive and significant at 10% for grade 4 test scores, and positive but insignificant for grade 7 test scores. In districts that start to face 6% or higher charter enrollment shares, grade 4 reading and math scores are predicted to rise by 1.4 percentile points (against national norms). Gains are similar for grade 7 but are not statistically significant.

As mentioned earlier, a generic problem in this approach is that unobserved changes within school districts could contaminate the results. A second drawback is that the data are school-level. It could be that charters are pulling low-scoring students away from the traditional public schools, thereby increasing the average test scores at these schools.

Booker, Gilpatric, Gronberg, and Jansen (2004) supplement their school-level analysis described earlier by studying the effects of charter penetration at the district level, but using student-level data to measure outcomes. Because their analysis of Texas data uses both school and student fixed effects, their approach greatly reduces the probability that compositional changes within schools are driving the results. They find a positive link between charter schools' enrollment shares at the district level and gains in achievement for students in traditional public schools. Their estimates of the effects of a one percentage point increase in charter penetration at

the district level are slightly higher than their estimates of the effects of increases in charter penetration at the school level reported earlier. Students' annual gains in achievement are predicted to be 0.02 and 0.03 of a standard deviation higher for every one percentage point increase in charter penetration at the district level.

Eberts and Hollenbeck (2001) examine competitive effects in Michigan schools. This study uses student-level data, but because Michigan did not give tests in the same subject in successive years, the study cannot use student fixed effects. The paper does not incorporate school fixed effects, but instead uses a district fixed effect. So the model uses changes in the dummy variable for presence of a charter *within* a district to identify the competitive effect of charter schools. Individual student test scores (for students in traditional public schools) are regressed on an indicator for presence of one or more charter schools in the district, dummies for years and district, and a number of student-level demographic variables as well as district spending per pupil. The models find evidence of small positive effects of charter presence on grade 5 science and especially writing scores, and small but negative effects on grade 4 math. Of these three effects, the largest is for grade 5 writing, where presence of a charter is estimated to boost test scores for students at traditional public schools by 1.6%.

The authors conclude based on tests for increasing effects over time and based on the grades in which charter schools have the larger market share that the data provide little evidence of competitive effects overall. Because the analysis cannot include student fixed effects and does not incorporate school fixed effects, composition bias and unobserved student differences in average gains in achievement could be issues.

Conclusion

Results from Florida, Texas and Arizona suggest that there are positive competitive effects of charters on traditional public schools. However, results from Michigan are mixed, with both positive and zero effects, and results from California and North Carolina suggest no effects.

Overall, then, the nascent literature on charter schools and competition suggests weakly that charters can induce a competitive response by school districts. However, the various methods used in the literature all suffer from potential problems. Further, the body of work to date is far too small, and too mixed, for us to draw strong conclusions at this point. In particular, many of the studies cover periods in which charter schools accounted for 2 or 3 percent of enrollment. It is hard to imagine that administrators at many traditional public schools will implement major reforms in response to such tepid competition. If there are non-linear responses to charter schools, then what researchers have found to date may be almost wholly unpredictive of what could happen in areas in which charter schools came to account for 20 or 30% of public school enrollment.

Apart from the obvious need to update studies, especially in regions that have undergone substantial charter growth since 2000, new areas of research allied to the basic question of competition need to be explored.

One area that is ripe for future study is how changes in state-mandated caps on the number or type of charter schools affect traditional public schools. North Carolina is a case in point. Bifulco and Ladd (2006) report that the state capped the number of charter schools at 100, and by the final year of their study 93 charter schools had already been created, representing only 1.4% of enrollment statewide. In this environment, it seems highly unlikely that most administrators at traditional public schools would view the charter movement as a major competitor. In contrast, in states with more liberal caps on charter schools, it may not be the *actual* competition that matters, so much as the *potential* competition. Baumol's (1982) theory of contestable markets says, in essence, that the efficiency of an industry depends less on the actual amount of competition than on the degree to which entry into the industry is inexpensive and easy. One potential way to study this phenomenon would be to examine changes in charter caps or other regulations that affect the costs of creating charter schools as a before-after experiment within a given state. Betts, Goldhaber, and Rosenstock (2005) discuss a number of policies that directly

influence the costs of creating a charter school. Changes in any of these policies could serve as a natural experiment to examine the effects of competition, whether current or potential.

Another major issue is that to date, researchers have treated the mechanisms through which charter competition might work as a black box. Specific questions that deserve investigation are, first, whether and by how much instructional practices or curriculum differ between charter schools and traditional public schools in the same district and, second, whether traditional public schools respond by adopting similar or other measures.

Finally, the empirical work on charter competition has focused understandably but narrowly on test scores. Yet parents should not really care about test scores except to the extent that test scores predict outcomes that really do matter for their children once they grow up, such as college attendance and earnings. In other words, instead of relying solely on test scores as a proxy for skills, the literature could follow former students into college and the workforce. Researchers could then model whether graduates of traditional public schools in districts with high degrees of competition from charter schools tend to fare better in terms of postsecondary attainment, weeks worked and earnings. Given the tender age of the charter school movement, such studies are only now becoming possible.

Our earlier discussion of the theory of choice also suggests that parents may care about many aspects of schooling that do not directly show up in test scores, or even adult outcomes. For instance, parents may care deeply about the safety of their children while at school. Survey evidence discussed by Schneider, Teske, and Marschall (2000) shows that most parents, when asked about how they choose schools for their children, pick answers that closely approximate "academic quality." But the second and third most commonly cited characteristics were "safety" and "values." Compared to white parents, African-American parents were particularly likely to mention school safety.

Implications for empirical research on the competitive effects of charters seem clear. Researchers should examine the literature on determinants of school choice to infer what factors apart from academic achievement matter for parents. School safety and values seem like obvious candidates. Then, they should ask whether the presence of charter schools improves the performance of traditional public schools along these lines. In the end, we may find that the nature of competition among schools transcends the confines of relatively narrow measures of achievement.

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