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Do small schools improve performance in large, urban districts? Causal evidence from New York City

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ABSTRACT

We evaluate the effectiveness of small high school reform in the country's largest school district, New York City. Using a rich administrative dataset for multiple cohorts of students and distance between student residence and school to instrument for endogenous school selection, we find substantial heterogeneity in school effects: newly created small schools have positive effects on graduation and some other education outcomes while older small schools do not. Importantly, we show that ignoring this source of treatment effect heterogeneity by assuming a common small school effect yields a misleading zero effect of small school attendance.

1. Introduction

While the academic achievement of US elementary school students has improved over the last decade, US high school students continue to graduate at unacceptably low rates and measures of achievement show only a slight upward trend since 2005 (National Center for Education Statistics, 2010). Moreover, the achievement and graduation gaps between white and black high school students and between white and Hispanic high school students have not changed. For example, by some calculations slightly over 80% of white students graduate within 4 years, but only 60% of black and 62% of Hispanic students do so and the gap in college readiness is similarly stark. In addition, with the erosion of the labor market for low-skilled workers over the past several decades, the gap in earnings between high school graduates and non-graduates has increased. Within this context many school systems with large proportions of poor students, in particular large urban school systems, face tremendous challenges; a majority of their students are at risk of not succeeding in high school and thus have more limited access to post-secondary education and have lower labor market earnings than many of their counterparts in suburban districts. While several reforms target high school students, the *small school reform* stands out because of its adoption in many major cities and its substantial public and philanthropic funding base. Placing students in small schools is advocated as a way to provide students with the support they need to improve their performance.

There have been at least two waves on small high school reform in US cities as well as an early and more recent literature on their effectiveness. The early wave of small school reforms in cities such as New York City (NYC), Chicago, Philadelphia and Oakland occurred in the early 1990s; and many of the intentionally-small high schools created then still exist. The early literature that stimulated and accompanied these reforms was conceptual (establishing theoretical reasons why small schools would help disadvantaged youth) and, when empirical, correlational in nature. A later wave of small school reform occurred after 2000 in NYC, Chicago, Los Angeles, San Diego, Philadelphia, and Boston among others, often with some funding from large foundations such as the Gates Foundation, the Carnegie Corporation, and the Open Society Institute as well as the U.S. Department of Education (U.S. Department of Education, 2006). The literature on this wave includes some studies using regression analysis (Stiefel (2009) for example), and, in one case, a lottery design (Bloom et al. 2010).

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In this study, we use administrative data covering all NYC public high school students to evaluate the effectiveness of two generations of small schools in NYC. The long recognized challenge in educational evaluations is the possible selection of students into the education intervention, which can bias simple comparisons of outcomes for those who are treated by the intervention and those who are not. In our application, selection bias arises if students who attend small and large schools differ on dimensions, such as motivation, ability, and parental support, which have an independent effect on the outcomes of interest. We address selection bias in two ways. First, we use a rich set of student characteristics, such as gender, race, language skills, and prior middle school test scores, to control for many of the observable differences between students attending small and large high schools. But, as in a wide variety of evaluation contexts, the observed student characteristics in our data are unlikely to fully eliminate unobserved or unmeasured differences in student characteristics that affect student outcomes.

Recognizing this potentially important selection on unobservables, we next turn to quasi-experimental methods using credible instrumental variables that exogenously influence student decisions to attend small schools but do not influence student outcomes. Since high schools of various sizes are not evenly distributed across the city, and students who live in the immediate vicinity of a small high school (especially relative to a large school) are more likely to attend a small school, we use as instruments the distance between the nearest small school or large school and the student's home.

Motivating our use of distance as an instrumental variable is a small but growing literature on the determinants of school choice.[1] A consistent result in the literature is that location (and specifically distance) of a school relative to a student's home residence is an important variable for students and parents in their choice of school. Schneider and Buckley (2002) report that in parent internet search behavior, location is the second most sought after piece of information after school demographics. Burgess and Briggs (2010), in a study of parental preferences for schools in England, conclude that parents make tradeoffs among academic attainment, school socio-economic composition, and travel distance. Hastings et al. (2006) find that in North Carolina proximity is highly valued by all, although families with strong preferences for academics are generally willing to tolerate longer distances. Saporito and Lareau (1999) conclude that both whites and blacks tend to choose schools close to their homes but whites are often willing to travel further to attend schools with higher proportions of white students. Motivated by this prior literature, we form instruments from the distance between the nearest small or large school and the student's home. A similar instrumental variables framework has been used in an educational evaluation of Chicago schools (Cullen et al., 2005), an evaluation of small schools (Barrow et al., 2010) and charter schools (Booker et al., 2011) in Chicago, and an examination of the effect of college attendance on earnings (Card, 1995) and on health behaviors (Currie and Morretti 2003). As this prior research has demonstrated in a variety of contexts, the likelihood of attending a school decreases as the distance to the school increases, perhaps because of higher costs such as those involving transportation.

We confirm these results with our NYC data and show that distance strongly predicts actual small school attendance, even after conditioning on student characteristics. We also present several additional analyses that support the instrument exogeneity. We use these distance based IVs to instrument for small school attendance and obtain IV estimates of the effects of attending small schools. Suggesting the importance of student sorting into schools based on unobserved student characteristics such as motivation, we find a positive effect of small school attendance with the OLS estimator but a small and imprecise estimate using the IV estimator.

An important contribution of this paper is to distinguish between the old and new generation of small schools. Rather than assume a common small school effect, we instead divide the small schools into those newly developed since 2002 and those which existed prior to the latest wave of reforms. These new small schools are different in a number of ways from the old small schools, differences that we further explore to assess whether they are related to effectiveness and whether they can or will be sustained.

Using models where we distinguish between new and old small schools, we find important differences in the effects of the schools in both our OLS and IV estimates. In our IV estimates, using instruments for distance to the new and old small schools, attending an old small school is estimated to have a negative effect on the probability of graduating relative to large schools, while attending a new small school is estimated to increase graduation rates by 17% relative to attending a large school. This estimate is statistically significant from zero at the five percent level and the magnitude of the estimate is robust to changes in sample selection, variable definitions, and various alternative instrumental variable estimators. When we turn to other high school outcomes, we find more mixed results. Our IV estimates indicate that attending a new small school increases the probability of taking the Regents English and mathematics examinations by 14% and 16% respectively. We estimate, however, a negative effect of new small school attendance on English scores and no effect on mathematics scores. We cannot rule out, however, that the non-positive effects on test scores is the result of the marginal test takers induced to take these exams having lower ability. In addition, we estimate that old small schools have considerably more negative effects on test scores than the new small schools.

Our estimates reveal a clear divide in the effects of the new versus old small schools and provide some context to understand the results of previous research. Studying a subset of the new small schools, which were over-subscribed and offered admission by lottery, Bloom et al. (2010) find a 6.8% point increase in graduation rates from attending these "small schools of choice". Our positive statistically significant effect of new small school attendance estimated using a different empirical strategy – the IV – is consistent with this finding, and given the standard errors, both estimates are within the other's 95% confidence interval. An advantage of our study is that we can use our identification strategy to estimate the effect of a wider variety of small school types. Thus, our estimates show that the positive effects estimated for the recent small schools would not necessarily extrapolate to *all* small schools. In particular, the older generation of small schools is estimated to have a negative effect on graduation, in contrast to the positive effect of the newer generation. This is a crucial finding for policy: school size matters but it is not sufficient for affecting outcomes on its own. It also provides a cautionary tale for policymaking in general. Much of the original enthusiasm by foundations and districts for small school reform was based on early OLS studies relating size to outcome; prior to 2002 there were no causal studies of the effects of small high schools. The results of our study show that, while OLS estimation yields positive effects for the old small

[1] Studies that rely on survey analysis indicate that parents generally choose based on academic achievement and the quality of teachers at the school (Armour and Peiser, 1998; Greene et al.1998) and do not exhibit much preference towards student demographics (Schneider et al., 1998). In contrast to survey studies, observed choice behavior reveals that parents do have strong preferences for schools with similar demographics (Schneider and Buckley, 2002; Hastings et al. (2006)). There is also literature on the impacts of choice, for example on socioeconomic and racial sorting and segregation (Ladd, 2003) and on decisions between private and public school (Hoyt and Lee, 1998).