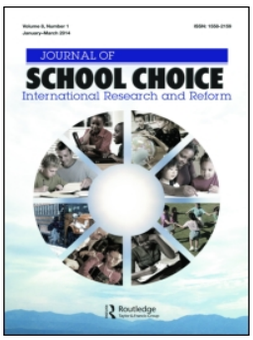

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Journal of School Choice
International Research and Reform

ISSN: 1558-2159 (Print) 1558-2167 (Online) Journal homepage: http://www.tandfonline.com/loi/wjsc20

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**To cite this article:** Albert Cheng, Collin Hitt, Brian Kisida & Jonathan N. Mills (2017) "No Excuses" Charter Schools: A Meta-Analysis of the Experimental Evidence on Student Achievement, Journal of School Choice, 11:2, 209-238, DOI: 10.1080/15582159.2017.1286210

**To link to this article:** http://dx.doi.org/10.1080/15582159.2017.1286210

JOURNAL OF SCHOOL CHOICE
2017, VOL. 11, NO. 2, 209–238
http://dx.doi.org/10.1080/15582159.2017.1286210

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# "No Excuses" Charter Schools: A Meta-Analysis of the Experimental Evidence on Student Achievement

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**ABSTRACT**

Many most well-known charter schools in the United States use a "No Excuses" approach. We conduct the first meta-analysis of the achievement impacts of No Excuses charter schools, focusing on experimental, lottery-based studies. We estimate that No Excuses charter schools increase student math and literacy achievement by 0.25 and 0.17, respectively, for approximately each year of attendance. These are large and meaningful gains. Moreover, these effects are substantially larger than those of attending other kinds of charter schools. We discuss policy implications and offer necessary caveats.

**KEYWORDS**

Academic achievement; charter schools; urban schools

## Introduction

For a generation, the racial achievement gap has defined the debate over public education in the United States. On standardized tests, achievement in math and reading is consistently lower for Black and Hispanic students relative to White students. This problem is not merely one of test scores: the dropout rate for Black and Hispanic students is twice the national average (Heckman & LaFontaine, 2010). These disparities are a catalyst for the present-day school reform movement. A key development within that movement has been the advent of charter schools, hundreds of which have opened with the aim of narrowing these achievement gaps, beginning with the test score gaps in reading and math.

U.S. charter schools are publicly funded and given a wide degree of flexibility over instructional, curricular, and staffing decisions. In exchange for this flexibility, charters are held more accountable than traditional public schools. Their operating charter must be issued and then renewed, and can also be revoked, by an authorizing entity. These schools were first established in the United States in the state of Minnesota in 1992 and since then have expanded throughout the country. Approximately 2.5 million U.S. students,

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representing about 5% of all public school students, are enrolled in charter schools today (U.S. Department of Education, 2016).

An essential feature of U.S. charter schools is that they are schools of choice: Unlike traditional public schools where school assignment is based upon where students live, charter school enrollment is open to all students. As schools of choice with operational autonomy, charter schools often cater to niche demand. They vary widely in philosophy and organizational structure. For instance, in the United States, a number of charter schools integrate facets of a particular ethnic culture, instructing children in its language, custom, and worldviews. These schools are often called ethnocentric charter schools (Buchanan & Fox, 2003). Others follow a particular pedagogical model such as the Waldorf or Montessori approach to education. Still others emphasize certain subject areas such as the performing arts or the STEM fields (science, technology engineering, and math). This meta-analysis focuses on charter schools that have embraced a "No Excuses" philosophy, which has become particularly popular in urban charter school sectors.

The name, and the tenets of, "No Excuses" were first laid out in a 2000 monograph by Samuel Casey Carter, a profile of 21 high-poverty schools that exhibited unusually high test scores. There were essential common elements across these schools, Carter argued. Among those: principals had management freedom, performance goals were based on measurable metrics, students were rigorously tested, discipline was strict, and a focus on academic achievement was pervasive.

The concept was further popularized in 2003 by Thernstrom and Thernstrom in their book *No Excuses: Closing the Achievement Gap in Learning*. Again, No Excuses schools were identified as those that focused intensely on raising the math and literacy scores of their students, who primarily come from low-income and racial minority backgrounds, in a deliberately regimented attempt to narrow the Black–White achievement gap. Thereafter, the No Excuses approach and moniker spread quickly throughout the charter school movement. Indeed today, No Excuses charter schools make up a majority of the local charter school sector in many American cities (Angrist, Pathak, & Walters, 2013).

While used widely, the term No Excuses is not always exact, and not always self-applied. Like Casey (2000) and Thernstrom and Thernstrom (2003), we use the following definition in identifying schools for this study. No Excuses charter schools have conspicuously high academic expectations. No Excuses charter schools often embrace a college-going culture—that is, they intently socialize and instill the goal of attending college into their students, many of whom would be the first in their families to do so. No Excuses charter schools also feature strict behavior codes, extended instructional time, and targeted instruction (e.g., tutoring) for low-performing students (Whitman, 2008). Many No Excuses charter schools have also

embraced data-based decision making, which focuses heavily on the data provided by standardized tests. Examples of these charter schools, including networks adopting the same model, include the Knowledge is Power Program (KIPP), YES Prep, Uncommon Schools, Achievement First, and Aspire charter schools.

It is worth noting that some charter schools, while exhibiting all of the previous traits, prefer to avoid the "No Excuses" label. This is a largely a semantic point, but one that is important to acknowledge. The No Excuses concept has been attacked as an overly rigid, even oppressive approach to education—and many charter schools are eager to avoid such attacks by avoiding the No Excuses brand, even if their practices fit the No Excuses definition (Maranto & Ritter, 2014).

The critics of No Excuses charter schools make serious claims. For instance, they have argued that charter schools have led to increased racial segregation, a claim with some empirical backing (Bifulco & Ladd, 2006; Zimmer et al., 2009). Other specifications have shown charters to have neutral (Ritter et al., 2010) or positive effects on racial integration (Ritter et al., 2016).

Another concern of No Excuses charter schools is the high level of teacher turnover in these schools. With extended work hours dedicated to serve students from traditionally disadvantaged backgrounds, teacher workloads in these charter schools are atypically large. Some scholars have maintained that this setting leads to burnout and teacher attrition, calling into question the sustainability of No Excuses charter schools (Lack, 2009; Torres, 2016).

Other critics charge that No Excuses charter schools are paternalistic and punitive (Boyd, Maranto, & Rose, 2014; Goodman, 2013; Lack, 2009). Horn and Wilburn (2013), for example, describe No Excuses charter schools as providing "a regimented, zero tolerance model that contributes to … children who follow orders well but who think poorly" (p. 223). In more recent work, Horn interviews more than 20 former teachers from KIPP schools, who almost uniformly describe a culture that puts teachers in conflict with students: Students are humiliated in order to maintain discipline, and as learners they are simply "treated as gaps to be bridged," with a focus on little else other than reading and math skills (Horn, 2016). Regardless of whether such a claim is representative, it is undoubtedly true that "No Excuses" charter schools are deeply controversial.

## Aim of study

Also evident, however, is the fact that No Excuses schools are growing in number, and so too are studies examining the schools' effectiveness. In this article, we conduct a thorough review and meta-analysis to estimate

effects of No Excuses charter schools on student achievement in math and reading.

We focus only on studies that use lottery-based methods. The design of these studies allow us to make the strongest possible statements about the causal impacts of charter schools on student outcomes (Baethge et al., 2015). Such studies use the random-assignment feature of enrollment lotteries at charter schools, which resembles the random-assignment component of randomized control trials used in pharmaceutical and psychological research. Over the past 5 years, a sizeable number of lottery-based studies have been conducted of charter schools, a substantial subset of which have focused on No Excuses schools.

By law in most states, any charter school, including No Excuses schools, must hold admission lotteries to determine enrollment when it is oversubscribed. Because all students who apply to these oversubscribed charter schools are subsequently admitted by random chance, any differences in academic outcomes between students who gain admission and students who do not can be attributed to attending the charter school as opposed to other factors such as family background. Put differently, studies using lottery-based methods provide unbiased estimates of the impact of enrolling in a charter school, conditional on application to an oversubscribed school. These studies, therefore, provide the best evidence on the causal impacts of No Excuses charter schools.

The primary strength of meta-analysis is that it combines studies with high internal validity into a larger analysis which improves external validity. The most rigorous, lottery-based studies of No Excuses charter schools typically focus on specific schools that are located in a single city or belong to single charter-school network, so the findings of any individual study cannot be generalized broadly. We use meta-analytic methods to overcome this limitation. We must, however, offer a caveat in our use of lottery-based studies. Lottery-based studies, of course, cannot be performed at schools without lotteries. No research can make generalizations about students who do not enter a lottery and remain in traditional public schools based on comparisons to students who enter a lottery to enroll in a charter school. In the case of charter schools, it is possible that schools without waiting lists or well-maintained lottery records may produce systematically different achievement results. Thus, the achievement impacts of charter schools with lotteries may not be representative of charter schools more generally. For a broader view, one must consider the non-lottery-based studies of charter schools. Research of U.S. charter schools generally indicates that charter-school students perform at least as well as their student counterparts in traditional public schools on standardized achievement tests (CREDO, 2009, 2013; Zimmer et al., 2009). In particular, CREDO's (2013) nonexperimental analysis of a majority of

charter schools across 27 U.S. states documents positive effects of 0.01 standard deviations in reading achievement and no differences in math achievement.[1] There is, however, evidence of effect heterogeneity present in the study's findings. Charter schools tend to be more effective in urban locales and in the elementary grades. Charter schools also improve over time, so older charter schools are more effective, and charter schools appear more effective at raising mathematics achievement than at raising reading achievement (Betts & Tang, 2014). Other studies have also found charter school quality to vary across U.S. states (Bifulco & Ladd, 2006; Chingos & West, 2015; Sass, 2006). In our discussion section, we explore whether the measured effects of No Excuses charter schools vary greatly across different study settings and grade ranges.

How charter schools accomplish these effects is an important question. Some research has documented that lower-performing students leave charter schools at higher rates than that of lower-performing students in traditional public schools. For instance, relative to traditional public schools, KIPP schools are less likely to replace low-achieving students who leave with similarly low-achieving students. The concern that lower-performing students are more likely to leave charters could potentially create positive peer effects in charter schools. This dynamic may overstate the positive effects that charters have on students and call into question whether these effects can be replicated at scale (Gleason, 2016).[2] However, studies of student exit from charter schools demonstrate that lower-achieving students do not necessarily exit charter schools at higher rates than higher achieving students. Even in cases where lower-achieving students are more likely to leave charter schools at higher rates, researchers find that those rates do not differ between charter schools and traditional public schools. In fact, lower-performing students are more likely to remain in charter schools than in traditional public schools (Winters, Clayton, & Carpenter, 2017; Zimmer & Guarino, 2013).

For this study, we first collected every known lottery-based evaluation of charter schools. We then conduct a meta-analysis of those studies, and a second meta-analysis on the subset of studies that focus on No Excuses charter schools. We estimate grand effect sizes for both intent-to-treat (ITT) and treatment-on-treated (TOT) estimates, which are the most two popular estimators in the program evaluation literature (e.g., Wolf et al., 2009; Kisida & Wolf, 2015; U.S. Department of Health and Human Services, 2010). The ITT estimator focuses exclusively on the oversubscription lottery result, effectively estimating how being offered admission to a charter school impacts student achievement.[3] However, not all students who win enrollment lotteries actually enroll in charter schools due to reasons that may be unrelated to school effectiveness and likely vary across studies. The TOT estimator attempts to estimate the impact of actually enrolling in a charter school by making a few assumptions about charter school uptake. TOT estimators often use the oversubscription

lottery result in an Instrumental Variables framework to predict the likelihood that one enrolls in a charter school. Because we are interested in summarizing the impact of enrolling in a charter school for this meta-analysis, we focus on the TOT grand-effect estimates and present them as follows. Estimates based on ITT effects are contained in the Appendix and are similar to TOT results.

The remainder of this article proceeds as follows. The next section describes our procedure for reviewing the literature and our criteria for including studies in the meta-analysis. Thereafter, we describe our analytic methods, followed by a presentation of our findings: No Excuses charter schools produce substantial gains in math and literacy. We conclude with a discussion of those findings.

## Search process and screening methodology

### *Overview*

The aim of our meta-analysis is to answer the following two research questions:

(1) Do No Excuses charter schools raise student achievement in math and English language arts (ELA)?
(2) Do student achievement gains differ between No Excuses charter schools and other charter schools?

We conducted a thorough search process with strict inclusion criteria to identify the research that is relevant for addressing these questions. Our primary search was conducted in 2014, with the screening and meta-analysis completed thereafter. A secondary search was conducted in 2016, in order to capture the most-up-to date findings. The search process consisted of four steps: (a) a database search for titles, (b) a review of abstracts, (c) an initial full reading of the articles, and (d) an in-depth reading of the articles. At each step, we identified articles that do not satisfy our inclusion criteria and excluded them from our analysis. We discuss each of the steps as follows. To ultimately be included in the review, we required the studies to satisfy seven conditions:

(1) The study was conducted and published after 1990, the year when the first U.S. charter school was established. There were no studies of charter schools prior to 1990.
(2) The study examines schools in the United States.
(3) The results include achievement outcomes in English language arts or math.
(4) The study utilizes lottery-based methods.

(5) The study must report nonrandom attrition in either the treatment or control groups.
(6) The study must report or control for baseline equivalence between treatment and control groups.
(7) Any study without the necessary statistics to derive point and interval estimates of an effect size (e.g., standard errors, sample standard deviations) would be excluded.

### Database search

After establishing these inclusion criteria, we identified titles that would be pertinent to our analysis. We searched numerous databases of peer-reviewed journal articles, dissertations, research reports that are self-published by research or academic institutions, and working papers. In particular, we relied on *Ebsco, ProQuest, Jstor, Google Scholar*, and the database of working papers from the National Bureau of Economic Research to identify these titles. We used two combinations of search terms, namely, (a) *charter school* and *random assignment* and (b) *charter school* and *lottery*.[4] We examined the titles that emerged from the search results, immediately excluding titles that were irrelevant to this review. Upon selecting a title for inclusion, we perused its bibliography and the curriculum vitae of its authors for further titles that meet our search and inclusion criteria.

### Abstract review

After excluding titles that were irrelevant for our research question, we reviewed the abstracts of the remaining studies. Based upon the additional information included in the abstract, we further excluded some studies not meeting our inclusion criteria and marked the remaining studies for an initial full reading.

### Initial full readings

The goal of giving the remaining articles an initial full reading was to decide which studies warranted an in-depth reading and coding of their details. Like the abstract reviews, the initial full readings revealed new information about the studies, and those that did not meet the inclusion criteria were excluded. We proceeded to give the articles that met the inclusion criteria an in-depth reading.

### In-depth readings

Two readers then read and coded each article that was selected for in-depth review. The following information for each study was collected:

- the study citation,
- whether the study investigated No Excuses charter schools,
- the location of the charter school,
- the years of the study period,
- information about the study participants (e.g., size of treatment and control groups, grade range),
- school characteristics (e.g., grade range, school size, name of school and/or charter network it belongs to),
- the degree of baseline equivalence between the treatment and control groups,
- the amount and details of crossover between treatment and control groups,
- the amount and details of study attrition,
- English language arts achievement results, and
- Math achievement results.

We are confident that we identified all available lottery-based studies of charter schools as well as the subset of these studies focusing on No Excuses charter schools. In several instances, the study's authors explicitly refer to schools in their sample as No Excuses schools and describe the defining characteristics of these schools. Recall that the essential characteristics of No Excuses schools are:

- a culture of college-going and high expectations,
- strong disciplinary and dress codes,
- a longer school day and/or school year, and
- targeted instruction for students who fall behind their peers (Angrist et al., 2013; Carter, 2000; Dobbie & Fryer, 2015; Fryer, 2011; Goodman, 2013; Thernstrom & Thernstrom, 2003; Whitman, 2008).

Although some studies in our review do not explicitly mention the term No Excuses, we always considered the description of the schools included in the study. We also gathered additional information about these schools using the Internet. Based on information provided by the study and our additional investigations, we were able to judge whether or not the schools in each study satisfied the criteria of a No Excuses school per our working definition of the term. That is to say, a school had to clearly meet all four defining features of a No Excuses charter school to be considered as such.

### *Search and screening results*

In all, we identified over 5,000 titles through the database search. However, the search yielded many irrelevant titles, with no more than 300 titles

retained for abstract review. Of these, we determined 76 titles merited a full reading. Full readings helped us identify additional studies that did not meet the inclusion criteria. For example, our focus on lottery-based studies led us to screen out studies of charter schools that use observational designs (e.g., Gutierrez, 2012; Witte et al., 2009; Wolfram, 2008; Woodworth, David, Guha, Wang, & Lopez-Torkos, 2008). We exclude them from our analysis for the reasons stated earlier: the lack of random assignment enrollment data begs questions about student selection bias. We discuss in our conclusion how the exclusion of these studies may affect the interpretation of the results and, ultimately, the assessment of the effectiveness of No Excuses charter schools.

We also identified, during the full reading stage, multiple versions of the same study. For instance, "Who Benefits from KIPP" by Angrist, Dynarski, Kane, Pathak, and Walters (2010b) is a working paper version of "Inputs and Impacts in Charter Schools: KIPP Lynn," which was published in *The American Economic Review* by the same authors (Angrist, Dynarski, Kane, Pathak, & Walters, 2010a). Similarly, Gleason and colleague's (2010) national evaluation is a report written for the U.S. Department of Education and has since been published in *Educational Evaluation and Policy Analysis* (Clark, Gleason, Tuttle, & Silverberg, 2015). In these cases, we chose the most recent version of the study.

Of the articles that received a full reading, 24 merited an in-depth review. Of these 24 articles, 10 were excluded in our meta-analysis. Three were excluded because they did not meet some of our inclusion criteria. First, McClure, Strick, Jacob-Almeida, and Reicher (2005) used a lottery-based design to evaluate achievement gains of The Preuss School, a charter school located on the campus of the University of California at San Diego. Yet upon a careful reading of the article, we found no tests for baseline equivalence among lottery winners and losers. Nor did the authors provide enough statistical information in their results for us to calculate an effect size. We excluded this study for those two reasons. Second, we excluded Grigg and Borman's (2014) evaluation of two charter schools in Denver, Colorado because of evidence of differential attrition rates between treatment and control group students. Third, we excluded Hoxby and Rockoff's (2004) lottery-based study of Chicago charter schools, as it did not contain the necessary statistical information to be included in our meta-analysis.[5]

The remaining seven of the 10 excluded articles met our inclusion criteria but contained overlapping analytic samples and were, therefore, excluded to avoid double counting. For example, samples for several studies of Boston charter schools (i.e., Abdulkadiroğlu et al., 2011; Angrist, Cohodes, Dynarski, Pathak, & Walters, 2016; Angrist, Dynarski, Kane, Pathak, & Walters, (2010a); Cohodes, Setren, Walters, Angrist, & Pathak, 2013; Finn et al., 2014; West et al., 2016) are all subsets of the study sample in Angrist, Pathak, and Walters's (2013) analyses of all charter schools throughout

Massachusetts. For this reason, we use the estimates in Angrist and colleagues (2013) for our meta-analysis and exclude the six studies of Boston, MA and Lynn, MA to avoid overcounting the effects of some charter schools. The seventh excluded study, a report written by Ferguson et al., (2012), contained a sample that overlapped with Gill and colleagues' (2016) peer-reviewed version in *Statistics and Public Policy*.

At the conclusion of our screening process, we retained 14 articles that used lottery-based methods to analyze the effects that charter schools have on student achievement, 10 of which have TOT estimates and four of which only have ITT estimates.[6] Four of these 10 articles with TOT estimates did not evaluate No Excuses charter schools, while five of these studies solely evaluated No Excuses charter schools. The remaining article (Angrist et al., 2013) included an estimate for all oversubscribed charter schools and a separate estimate for No Excuses charter schools. The list of studies for our meta-analysis based upon TOT estimators is shown in Table 1.

When collecting estimates from an in-depth review of the articles, we established the following decision rules:

- If a study provided separate results for different years of exposure, we counted only the analysis that incorporated the longest duration of treatment.[7]
- If a study only presented results separately across grades (e.g., middle school/high school), we counted each separate analysis as a standalone estimate.[8]
- If a study pooled results across grades (e.g., middle school/high school), we used pooled results, even if breakdowns were given.

Among the 10 articles that include a TOT analysis, we have 32 estimates of the effectiveness of oversubscribed charter schools on improving achievement in math and ELA, 18 of which are estimates of the effectiveness of No Excuses charter schools. In column 2 of Table 1, we indicate whether the particular estimate focuses exclusively on No Excuses schools.[9]

As shown in the third and fourth columns of Table 1, studies that do not focus on No Excuses charter schools cover a diverse array of charter schools over a wide geographic region. For example, Clark and colleagues (2015) examine a nationwide sample of charter middle schools. While there certainly are No Excuses charter schools in the sample used by Clark and colleagues (2015), there are other types of charter schools as well. The authors do not report subgroup findings for No Excuses charter middle schools. Such studies have been included in our overall analysis of charter school performance, but clearly could not be included in our analysis of No Excuses charter school performance. Abdulkadiroğlu, Angrist, Narita, and

**Table 1.** Lottery-based studies estimating the effect of charter school enrollment on achievement.

| Study | Exclusively No Excuses? | Location | Schools | Results | |
|---|---|---|---|---|---|
| | | | | ELA | Math |
| Abdulkadiroğlu et al. (2015) | No | Denver, CO | 24 middle, 7 high | + | + |
| Angrist et al. (2013) | No | MA | 17 middle | + | + |
| Angrist et al. (2013) | No | MA | 6 high | + | + |
| Dobbie and Fryer (2013) | No | New York City | 19 elementary | + | + |
| Dobbie and Fryer (2013) | No | New York City | 10 middle | 0 | + |
| Clark et al. (2015) | No | 13 U.S. states | 33 middle | 0 | 0 |
| Hoxby and Murarka (2009) | No | New York City | 42 schools | + | + |
| Abdulkadiroğlu et al. (2016) | Yes | Boston, MA | 1 middle | + | + |
| Angrist et al. (2013) | Yes | MA | 9 middle | + | + |
| Angrist et al. (2013) | Yes | MA | 4 high | + | + |
| Curto and Fryer (2014) | Yes | Washington, DC | 1 middle school | + | + |
| Dobbie and Fryer (2011) | Yes | New York City | 1 elementary | 0 | 0 |
| Dobbie and Fryer (2011) | Yes | New York City | 1 middle | 0 | + |
| Hastings, Neilson, and Zimmerman (2012) | Yes | Anonymous | 2 elementary, 2 middle, 1 high | + | 0 |
| Tuttle et al. (2015) | Yes | 5 states and DC | 8 elementary | + | + |
| Tuttle et al. (2015) | Yes | 8 states | 16 middle | 0 | + |

*Note*. Only studies that report TOT estimates are shown. +, -, and 0 denotes positive and statistically significant, negative and statistically significant, statistically insignificant result, respectively, as reported by the author. Angrist et al. (2013) is listed twice because the authors present estimates for Massachusetts as a whole and urban schools specifically (which they note are all No Excuses schools).

Pathak's (2015) study of charter schools in Denver was not included in the No Excuses analysis for the same reason.

The 18 estimates of No Excuses charter schools also come from a variety of contexts as well. Some studies focus on schools operating within the same network. For example, Tuttle and colleagues (2015) is an evaluation of KIPP, a national network of No Excuses charter schools. Others studies evaluate a single charter school (Abdulkadiroğlu, Angrist, Hull, & Pathak, 2016; Curto & Fryer, 2014; Dobbie & Fryer, 2011) or charter schools throughout an entire state (Angrist et al., 2013).

For all studies of charter schools, of the 16 reading achievement estimates that we identify, 11 are positive, five are statistically insignificant, and none are negative. Of the 16 math achievement estimates that we identify, 13 are positive, three are statistically insignificant, and none are negative. When we solely consider the nine analyses of reading achievement for No Excuses charter schools, six estimates are positive and three are statistically insignificant. For math achievement, seven of the nine estimates demonstrate positive effects, while two estimates are statistically insignificant.[10]

Generally speaking, these estimates suggest that oversubscribed charter schools of various types have a positive effect on student achievement. The same is true for No Excuses charter schools. However, simply tallying the results of studies does not provide a true estimate of the average magnitude or significance of these effects. For that, we turn to the formal meta-analysis presented in the next section.

## Meta-analytic methods

For our primary analysis, we use random-effects meta-analysis, which estimates a general effect size across studies examining heterogeneous populations. We chose this method over a fixed-effects meta-analysis, which essentially assumes that each of the individual studies considered are examining the same population of subjects.[11] While it seems plausible that No Excuses charter schools across the nation have similar samples of students, this assumption likely fails with respect to charter schools, given the great observed heterogeneity of charter schools (Betts & Tang, 2014). Random-effects meta-analysis provides a more flexible approach to analyzing the results of multiple studies.

Our random-effects meta-analysis simply uses a weighted average of the individual study effect sizes to estimate the overall effect of oversubscribed No Excuses charter schools. Our estimate of the grand effect size for oversubscribed No Excuses charter schools is given by $G$ in Equation 1:

$$G = \frac{\sum_i W_i \delta_i}{\sum_i W_i}, \tag{1}$$

where $\delta_i$ is the reported effect size for study $i$ and $W_i$ is a study specific weight. For our purposes, each individual study is weighted by the inverse of the sum of its within-study effect size variance and an estimate of the variance in effects between studies. That is,

$$Wi = \frac{1}{var\{\delta_i\} + T^2}, \tag{2}$$

where $var\{\delta_i\}$ is simply the squared value of the individual effect size's standard error ($se\{\delta_i\}^2$) and $T^2$ is an estimate of the true between-study effect size variance.[12] Given that the between-study effect size estimate is constant across studies, we are effectively weighting each finding by the

precision of the estimated effect, with studies with smaller effect size standard errors contributing relatively more weight to the grand effect.

An alternative approach would be to weight individual effect sizes by the sample size, with larger studies contributing relatively more information to the estimated effect than smaller studies. Technically, this would ignore the different levels of precision achieved by different studies, which vary in analytic methods and data quality, though in reality, this weighting method should not produce widely different results given the strong relationship between standard errors and sample size. We tested this assertion by duplicating our analysis while weighting for sample size instead of inverse variance. The results from the two methods were not substantively different.

## Results

### *Results for charter schools generally*

We first look at TOT estimates from lottery-based charter school studies generally, not just those of No Excuses charter schools. Results of this analysis are presented in the upper panel of Table 2. Our primary results are presented in column 1, which pools all of the effect estimates across all grade levels. On balance, attending charter schools increases ELA achievement by 9% of a standard deviation and math achievement by 19% of a standard deviation. These effect sizes are substantively and statistically significant. Corresponding ITT results can be found in the Appendix.

Columns 2 through 5 present results separately reported by grade-level ranges. Estimates in each column are mutually exclusive, representing studies that either provided only results disaggregated at a particular grade range or studies that did not disaggregate their findings.[13] Like overall results listed in column 1, these reported grand effect sizes are positive and largely significant at the 0.05 level across all studies, with slightly larger effect estimates for math than ELA. The only exception to this pattern are effect on math achievement based upon studies that do not disaggregate estimates by grade level range. As shown in column 5, effects are positive but not statistically significant at conventional levels.

Forest plots displaying the distribution of the effect sizes by study, along with their associated 95% confidence intervals, across individual studies in math and ELA are shown in Figures 1 and 2, respectively. Although there are some outliers, most individual estimates hover near the grand effect size, which is marked in the last row of the two figures. We also list grade level, sample size, and 95% confidence interval estimate for each study as well how much weight its estimate contributes to the overall estimate.

**Table 2.** Estimated TOT grand effect sizes.

| | | Grade Level Range | | | |
|---|---|---|---|---|---|
| | All | Elementary | Middle | High School | Not Disaggregated |
| | (1) | (2) | (3) | (4) | (5) |
| *Full sample of charter schools* | | | | | |
| ELA | | | | | |
| Grand effect size | 0.09 [0.05, 0.13] | 0.15 [−0.01, 0.31] | 0.06 [0.02, 0.11] | 0.21 [0.09, 0.32] | 0.14 [−0.01, 0.28] |
| p-value | 0.00 | 0.07 | 0.01 | 0.00 | 0.06 |
| Studies | 14 | 3 | 7 | 1 | 3 |
| N | 90,606 | 16,838 | 39,072 | 4,103 | 30,593 |
| Math | | | | | |
| Grand effect size | 0.19 [0.13, 0.24] | 0.19 [0.04, 0.34] | 0.18 [0.11, 0.25] | 0.27 [0.13, 0.41] | 0.17 [−0.12, 0.46] |
| p-value | 0.00 | 0.02 | 0.00 | 0.00 | 0.25 |
| Studies | 14 | 3 | 7 | 1 | 3 |
| N | 90,518 | 16,558 | 39,317 | 4,050 | 30,593 |
| *No Excuses charter schools only* | | | | | |
| ELA | | | | | |
| Grand effect size | 0.17 [0.10, 0.23] | 0.23 [0.00, 0.45] | 0.12 [0.06, 0.17] | 0.26 [0.13, 0.40] | 0.35 [0.13, 0.57] |
| p-value | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 |
| Studies | 9 | 2 | 5 | 1 | 1 |
| N | 21,504 | 1,399 | 16,064 | 3,567 | 474 |
| Math | | | | | |
| Grand effect size | 0.25 [0.19, 0.32] | 0.28 [0.07, 0.49] | 0.28 [0.23, 0.32] | 0.34 [0.19, 0.49] | −0.09 [−0.31, 0.13] |
| p-value | 0.00 | 0.01 | 0.00 | 0.00 | 0.41 |
| Studies | 9 | 2 | 5 | 1 | 1 |
| N | 21,460 | 1,119 | 16,348 | 3,519 | 474 |

*Note.* Columns 2 through 5 are mutually exclusive and are summarized by the grand effect size estimates reported in column 1. Values in brackets represent the lower and upper bounds of the associated 95% confidence interval. The estimates for the full sample include the Angrist et al. (2013) statewide Massachusetts estimates but not the urban-only estimates; vice versa for the No Excuses meta-analysis. See Table 1 for more details.

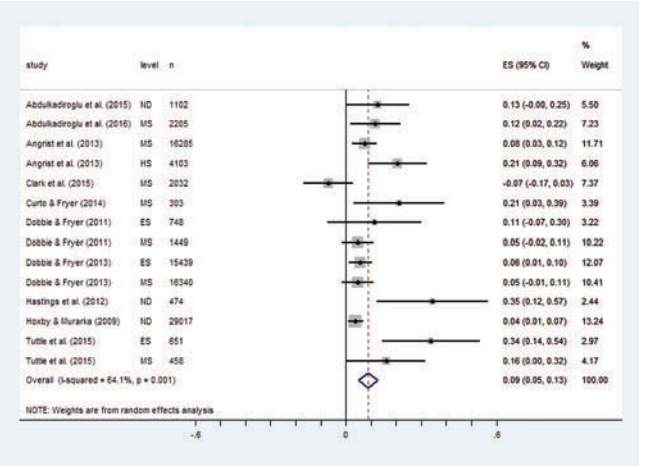


**Figure 1.** TOT estimates of the effects of charter schools on ELA achievement
*Note*. ES = elementary school; MS = middle school; HS = high school; ND = findings not disaggregated by grade-level.

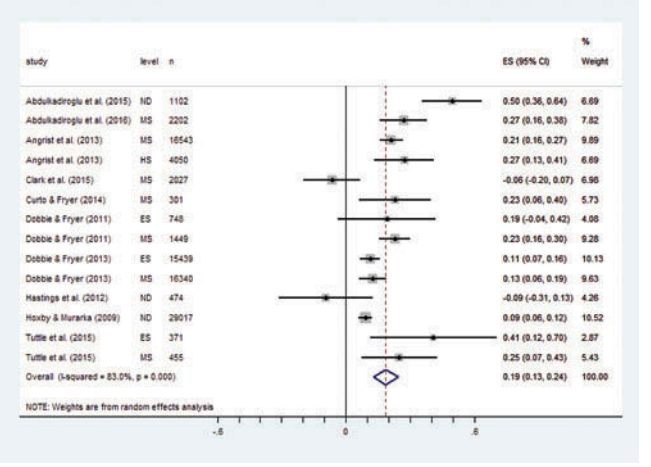


**Figure 2.** TOT estimates of the effects of charter schools on math achievement.
*Note*. ES = elementary school; MS = middle school; HS = high school; ND = findings not disaggregated by grade-level.

The lower panel of Table 2 focuses on results for No Excuses charter schools. These results are thematically similar to those presented in the upper panel of Table 2: No Excuses charter schools are found to have positive and largely significant impacts on student math and ELA achievement. Moreover, grand effects sizes for No Excuses charter schools tend to be larger in magnitude compared to the general analysis of charter schools. Forest plots of effect sizes in Figures 3 and 4, indicate that almost all studies of No Excuses charter schools report positive and statistically significant effects on student achievement.[14]

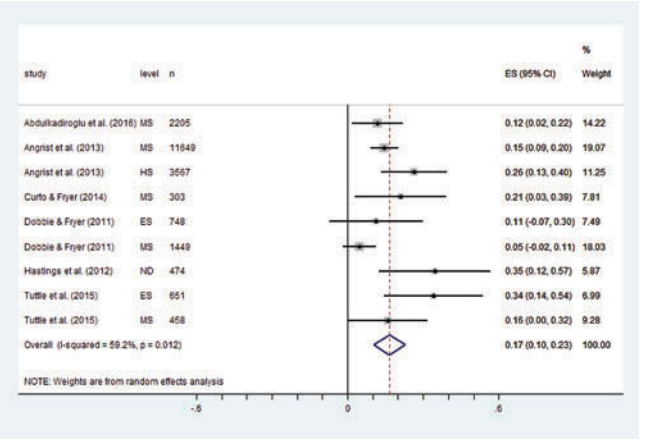


**Figure 3.** TOT estimates of the effects of No Excuses charter schools on ELA achievement.
*Note*: ES = elementary school; MS = middle school; HS = high school; ND = findings not disaggregated by grade-level.

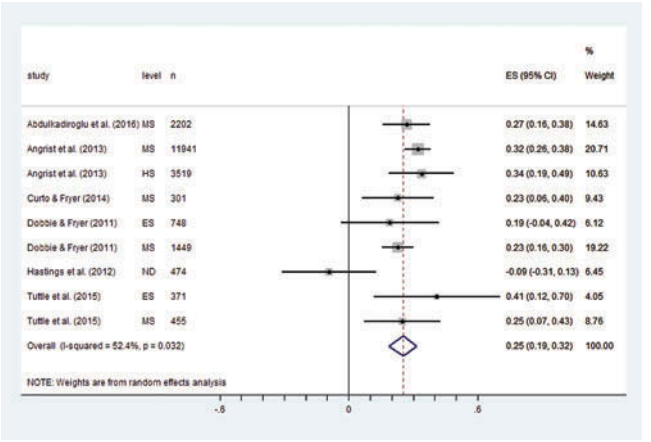


**Figure 4.** TOT estimates of the effects of No Excuses charter schools on math achievement.
*Note*: ES = elementary school; MS = middle school; HS = high school; ND = findings not disaggregated by grade-level.

## Discussion and conclusion

### *Summary of results*

The results presented in the previous section confirm the descriptive findings presented in Table 1: oversubscribed charter schools, particularly those that utilize the No Excuses model, appear to have positive effects on student math and ELA achievement. While our findings for the overall sample of random assignment studies on charter schools largely confirm the findings of a 2014 meta-analysis by Betts and Tang on charter school effects, our study adds to

the literature on charter school achievement impacts by focusing on No Excuses charter schools. The results highlight the relative success of No Excuses charter schools, as the estimated grand effect sizes for the sample of No Excuses charter schools are consistently higher than those estimated for the more general sample of random assignment charter school studies. Math achievement for students who attend No Excuses charter schools is 0.25 standard deviations higher than for students who attend traditional public schools. ELA achievement for students who attend No Excuses charter schools is 0.17 standard deviations higher than those who attend traditional public schools. Analogous differences for students who attend other types of charter schools are 0.19 standard deviations for math achievement and 0.09 standard deviations for reading achievement.

Consistent with other research, we also find some evidence of heterogeneity in charter school effects (Betts & Tang, 2014). For instance, No Excuses charter schools are more effective in improving math than in improving reading achievement, a pattern borne out in the general literature on charter schools. Other research has also found that charter schools are more effective in urban areas than in nonurban areas. Our findings may partially explain this pattern as No Excuses schools do better than other types of charter schools and, at the same time, are primarily located in urban areas. Finally, keeping in mind that there are few studies of No Excuses charter schools at the elementary and high school levels, our results suggest that these schools appear effective at all grade levels.

Still, one must be careful not to overstate the greater effectiveness of No Excuses charter schools. The studies included in our meta-analysis are based upon comparisons between charter-school students and a comparison group that comprised mostly of students in traditional public schools. Insofar that there is positive selection into a No Excuses charter school instead of a different type of charter school, we cannot conclude that No Excuses charter schools are more effective. Making a strong empirical case that No Excuses charter schools are more effective than other charter schools would require randomly assigning students to both types of charter schools and comparing outcomes. That said, the differences in effect sizes between the two types of charter schools is striking and some research suggests that components of schooling unique to the No Excuses model contribute to student success (Fryer, 2011).

### *Magnitude of the effects of no excuses charter schools*

The impacts of No Excuses charter schools on math and ELA scores are large and meaningful. The Black–White math achievement gap is often equated to one standard deviation on standardized test scores, while Black–White literacy achievement gap ranges from about 0.7 to 0.8 standard deviations (Hill, Bloom, Black, & Lipsey, 2008). The No Excuses approach to schooling aims

explicitly to close this gap. To reiterate, we find that attending a No Excuses charter school for approximately 1 year increases student achievement by 0.25 and 0.17 standard deviations in math and literacy, respectively, net of the typical annual growth that students experience. According to Hill et al., (2008) standards, attending a No Excuses charter schools for 1 year closes approximately 25% of the Black–White math achievement gap and approximately 20% of the Black–White literacy achievement gap. A straightforward extrapolation of these results suggests that attending a No Excuses charter school for 4 to 5 years could eliminate the achievement gap.

To provide another sense of the effect size of No Excuses charter schools, one can observe the magnitude of the additional gains in learning from attending a No Excuses charter school relative to the magnitude of typical learning gains that students experience annually. Hill et al., (2008) document that average learning gains in math for students in Grades 5 through 12—the typical age of No Excuses charter school students—is 0.23 standard deviations per year. The same group of students gains about 0.21 standard deviations in reading per year. Thus, the additional gain of 0.25 standard deviations in math that No Excuses charter schools provide more than doubles the amount of annual learning that the average student experiences. Similarly, the additional gain of 0.17 standard deviations in reading that No Excuses charter schools provide is approximately three quarters of the annual learning that the average student experiences. The magnitude of these additional learning gains relative to typical annual learning gains, together with the proportion of the Black–White achievement gap that is closed, suggests that the effect size of No Excuses charter schools on math and literacy is large and meaningful.

## Limitations and future research

### External validity

Yet there are some limitations to mention. The first is a methodological point. The understanding and assessment of No Excuses charter schools is largely shaped and limited by lottery-based research methods studying these schools. Though informative, such research cannot provide a conclusive appraisal of No Excuses charter schools, not to mention all charter schools. In social science, there is almost always a tradeoff when choosing a research design. Studies that maximize internal validity often sacrifice external validity, and vice versa. The primary value of meta-analysis, as we have done, is that it allows researchers to combine several studies with high internal validity into a single analysis that has high external validity.

Nonetheless, using this high research standard also narrows the scope of schools examined to those with waiting lists and well-kept lottery records. Such schools may be not representative of all No Excuses charter schools. For

example, when comparing nonexperimental estimates of oversubscribed and undersubscribed charters schools in Boston, Abdulkadiroğlu and colleagues (2009) find positive effects in both instances, but they find that oversubscribed charter schools tend to outperform charter schools with lower demand. Charter schools are either oversubscribed or not oversubscribed for nonrandom reasons. For instance, better schools might have longer waitlists because of higher parental demand, a proposition that would explain the findings in Abdulkadiroglu and colleagues' (2009) study. Parental demand for oversubscribed charter schools, especially oversubscribed No Excuses charter schools, may be higher due to their reputation of high academic quality. Indeed, parents rely on social networks and the name branding of schools when selecting schools for their children (Cheng et al., 2016; Schneider & Buckley, 2002; Schneider et al., 2000; Trivitt & Wolf, 2011). Many of these parents seek high academic quality and are able to recognize that higher-performing oversubscribed charter schools offer that feature (Bast & Walberg, 2004; Schneider & Buckley, 2002; Schneider et al., 2000). Thus, while we can be confident about the effects generated in our meta-analysis of lottery-based studies of charter schools, we cannot simply assume that these effects are generalizable to charter schools that are not oversubscribed, even as we leverage the ability of meta-analysis to increase external validity.

Likewise, while the recent increase in the volume of random-assignment studies of charter schools possesses wide geographic coverage, the studies of No Excuses charter schools are primarily concentrated on schools in the eastern United States. We anticipate that forthcoming studies will provide greater geographic diversity and enable researchers to examine whether No Excuses schools will fare just as well in other locales. Studies of the expansion of the KIPP charter network across the nation provide only incipient supporting evidence of this possibility (Tuttle et al., 2015).

### *Outcomes besides test scores*

Apart from the limitations of random assignment studies are the limitations of standardized test scores as an evaluation tool. The research we analyze focuses primarily on achievement effects of charter schools, even though they are only one of many other important educational outcomes. Unfortunately, few studies have considered other learning outcomes, such as student motivation, engagement, and other personality dispositions and character traits that have been shown to be independent determinants of future well-being (Almlund, Duckworth, Heckman, & Kautz, 2011; Mills, 2013; Levin, 2012). For example, Zimmer and colleagues (2009) find that charter school students are more likely to graduate from high school and attend college, and Sass, Zimmer, Gill, and Booker (2016) find that students who attend charter

schools have higher educational attainment and higher incomes in adulthood, despite little improvement in test scores.

In No Excuses charter schools, Dobbie and Fryer (2015) find that students have lower incidences of teen pregnancy and incarceration, yet they also find that charter students self-report lower levels of grit. Whether this result is attributable to reference-group bias that leads to students underreporting their level of grit or evidence that No Excuses schools actually lower grit and other related noncognitive skills is unclear (West et al., 2016). Tuttle and colleagues (2015) similarly do not find impacts on student noncognitive skills. Furthermore, the lack of commensurate effects between achievement and educational attainment in these studies is consistent with the proposition that No Excuses charter schools are improving student achievement but not improving noncognitive skills that contribute to long-run life outcomes. Indeed, although research suggests that No Excuses charter schools have pushed students to attend 4-year colleges rather than 2-year colleges, they do not appear to have impacts on college enrollment overall and persistence through college (Angrist et al., 2016; Dobbie & Fryer, 2015). On the other hand, a more recent lottery-based evaluation of a No Excuses charter school network in Chicago finds impacts on college attedance and persistence (Davis & Heller, 2015). Time and subsequent research is needed to more fully evaluate No Excuses charter schools. Whether higher test scores come at the cost of noncognitive skills is an emerging question that we anticipate to gain more scholarly attention.

Another potential tradeoff concerns the issue of racial segregation in No Excuses schools. As mentioned earlier, No Excuses charter schools have been noted to increase racial segregation in some cases, while other scholars have criticized the intensive workload that these schools demand from their teachers (Lack, 2009; Miron et al., 2010; Torres, 2016). These are legitimate concerns and how they ought to be weighted alongside student achievement gains and other outcomes is a subject for debate. Decreasing racial segregation and improving student achievement can be mutually exclusive goals. As Whitehurst, Reeves, and Rodrigue (2016) write in their review of racial segregation in charter schools:

> The desire for more integrated schools is understandable. But it is helpful to be as clear as possible about what lies behind that desire. If the main objective is to narrow racial achievement gaps, we need to understand to what extent, and in what way, segregation influences those gaps. The weight of evidence suggests that, at least in the context of the education system, the worse educational outcomes for minority students are the result not of the racial composition of their schools, but the economic backgrounds of their fellow students, and the quality of the school itself—both of which are strongly correlated with race.

An analogous comment may be made regarding demands placed on teachers. Lowering teacher burnout and turnover are preferable but how

much this goal should be prioritized relative to the success of the No Excuses model in raising student achievement is not clear. Many No Excuses charter schools recognize the need for supporting teachers (Lake et al., 2012; Woodworth et al., 2008).

Charters schools generally, and No Excuses charter schools particularly, will continue to be controversial issues in education policy. Our meta-analytic review suggests that insofar as the achievement gains that we have documented translate into improvements in later-life welfare, No Excuses charter schools could serve as an important model to schools serving disadvantaged students, particularly in the United States. However, a measured optimism is warranted given existing points of contention regarding these schools. For instance, if future research finds that the sizeable test-score impacts of No Excuses charter schools do not translate into impacts on later-life outcomes, the value of the No Excuses approach should be reassessed, not to mention the value of standardized tests as an evaluation tool. Time and future research will tell. For now, and for as long as the achievement gap in test scores remains a central focus of U.S. education policy, the notable achievement impacts of No Excuses charter schools should be of great interest to policymakers seeking to close those gaps.

## Notes

1. We note that the results in the earlier CREDO (2009) report are less favorable for charter schools. According to that report, only 17% of charter schools outperformed their charter schools. That said, we emphasize the CREDO (2013) results as they are more recent and cover a wider sample of states as well as a longer duration of time. In our view, CREDO (2013) supersedes CREDO (2009).
2. Note that this issue does not necessarily invalidate the findings of lottery-based studies. Intent-to-treat analyses still count these students who exit charter schools as attending a charter. Of course, intent-to-treat analyses fail to address this issue if exiting students completely attrite from the sample, but in this meta-analysis, we rely on those that report no differential attrition on observable characteristics.
3. Intent-to-treat (ITT) analysis simply compares the average outcomes of students randomly assigned to the treatment and control groups. In doing so, the estimator does not attempt to account for how or if lottery scholarships were actually used. For example, lottery winners who declined to enroll in charter schools are still included in the treatment group in ITT analysis. The ITT analysis makes full use of the random nature of the scholarship assignment process, and, therefore, provides unbiased estimates of the impact of receiving the opportunity to enroll in a charter school.
4. Although we restricted our search to studies that use lottery-based design, we did not restrict our search to No Excuses charter schools. We did this for two reasons. The first reason deals directly with one of our research questions: We must include studies of all charter schools because one of our research aims is to determine whether there is a difference between No Excuses charter schools and other charter schools that are also oversubscribed. Second, we conducted a broader search so that we would not unnecessarily omit titles that would not have appeared in a narrower search. For example, it

is possible that a study does not refer to a charter school as No Excuses, but after further inspection it may be identified as such. By using broad search terms we produced a larger set of titles and reduced the possibility of erroneously omitting a title relevant to answering our research questions.

5. McClure and colleagues (2005) found null to positive effects in achievement for students who attended Preuss, though it is unclear to what extent the authors controlled for baseline characteristics of students. Grigg and Borman (2014) found null results, and Hoxby and Rockoff (2004) found positive results. The sample sizes in each of these studies were modest and none focused definitively on No Excuses charter schools, their inclusion would not have substantively impacted our main findings.
6. Deutsch (2013), Gill and colleagues (2016), Unterman, Bloom, Byndloss, and Terwelp (2016), and Angrist and colleagues (2011) only report ITT estimates. Unterman and colleagues (2016) is a more recent study of SEED charter school so we use their ITT estimates rather than on those from Curto & Fryer's (2014) study of SEED. Angrist and colleagues (2011) is a working paper version of Angrist and colleagues (2013), which is published in the *American Economic Journal: Applied Economics*. Though we use TOT estimates from Angrist and colleagues (2013), we rely on Angrist and colleagues (2011) for ITT estimates since the peer-reviewed version does not report them.
7. This rule applied to two studies with TOT estimates: Clark and colleagues (2015) and Tuttle and colleagues (2015). For the purposes of the meta-analysis in the next section, this distinction is noteworthy but largely irrelevant, as these studies only represent 7.8% of the total number of ITT estimates and 4.0% of the total number of TOT estimates. Moreover, the 2-year estimates are similar to the 1-year estimates. Unterman and colleagues (2016) had 4-year ITT estimates for one cohort in their evaluation of SEED charters but due to significant sample attrition, we use 3-year estimates.
8. For example, Dobbie and Fryer (2011) provided separate estimates of students who entered the kindergarten and middle school lotteries of the Harlem Promise Academies. At no point did the authors pool these results. The results were reported separately by the authors, and are thus counted separately in our analysis.
9. The nine middle and four high schools in Angrist and collegues' (2013) No Excuses estimate are a subset of their overall estimate based upon 17 middle and six high schools.
10. See the Appendix for analogous information regarding the four studies that only provided ITT estimates.
11. For more detailed information on the differences between fixed- and random-effects meta-analysis, see Borenstein, Hedges, Higgins, and Rothstein (2009).
12. Our random-effects meta-analysis is performed using Stata's metan command (Harris et al., 2008), which estimated between-study error variance using the Q statistic procedure developed by DerSimonian and Laird (1986). While highly popular, the DerSimonian and Laird random-effects meta-analysis estimator is inefficient in meta-analyses based on few studies (Jackson, Bowden, & Baker, 2010).
13. We use the random-effects estimator developed by DerSimonian and Laird (1986) in our meta-analysis. This method has been shown to be inefficient when a small number of studies are included (Jackson, Bowden, & Baker, 2010). The results presented in columns 2 through 5 in Tables 2 through 4 likely reflect this imprecision, given the small number of studies included in the analysis.
14. As a sensitivity test to ensure that a single study of No Excuses charter school is driving the results, we reran the meta-analysis by excluding each of the six studies one at a time. Estimated grand effects after excluding one of the studies are similar. They range from 0.21 to 0.28 standard deviations in math achievement and 0.15 to 0.19 standard deviations in ELA achievement. Full results are available upon author request.

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## Appendix: ITT results

**Table A1.** Lottery-based studies of charter school achievement effects with ITT estimators.

| Study | Exclusively No Excuses? | Location | Schools | Results | |
|---|---|---|---|---|---|
| | | | | ELA | Math |
| Angrist, Pathak, and Walters (2011) | No | MA | 16 middle | + | + |
| Angrist et al. (2011) | No | MA | 6 high | + | + |
| Clark et al. (2015) | No | 13 U.S. states | 33 middle | 0 | 0 |
| Deutsch (2013) | No | Chicago, IL | 1 Grade 4–8 school | 0 | 0 |
| Dobbie and Fryer (2013) | No | New York City | 19 elementary | + | + |
| Dobbie and Fryer (2013) | No | New York City | 10 middle | 0 | + |
| Gill et al. (2016) | No | Nationwide | 12 middle and high schools | 0 | + |
| Angrist et al. (2011) | Yes | MA | 9 middle | + | + |
| Angrist et al. (2011) | Yes | MA | 4 high | + | + |
| Dobbie and Fryer (2011) | Yes | New York City | 1 elementary | 0 | 0 |
| Dobbie and Fryer (2011) | Yes | New York City | 1 middle | 0 | + |
| Tuttle et al. (2015) | Yes | 5 states and DC | 8 elementary | + | + |
| Tuttle et al. (2015) | Yes | 8 states | 16 middle | + | + |
| Unterman et al. (2016) | Yes | Washington, DC | 1 middle (Grade 6) | 0 | 0 |
| Unterman et al. (2016) | Yes | Washington, DC | 1 middle (Grade 7) | + | + |

*Note*: + denotes positive and statistically significant result; +, -, and 0 denotes positive and statistically significant, negative and statistically significant, statistically insignificant result, respectively, as reported by the author

**Table A2.** Estimated ITT grand effect sizes.

| | | School Level | | | |
|---|---|---|---|---|---|
| | All | Elementary | Middle | High School | Not Disaggregated |
| | (1) | (2) | (3) | (4) | (5) |
| *Full Sample of Charter Schools* | | | | | |
| ELA | | | | | |
| Grand Effect Size | 0.05 [0.02, 0.09] | 0.12 [0.00, 0.25] | 0.04 [−0.01, 0.09] | 0.11 [0.02, 0.21] | −0.01 [−0.07, 0.06] |
| p-value | 0.01 | 0.03 | 0.11 | 0.02 | 0.87 |
| Studies | 13 | 3 | 7 | 1 | 2 |
| N | 54,955 | 16,838 | 33,171 | 3,303 | 1,262 |
| Math | | | | | |
| Grand Effect Size | 0.12 [0.07, 0.18] | 0.14 [0.06, 0.21] | 0.15 [0.05, 0.25] | 0.16 [0.03, 0.29] | 0.01 [−0.17, 0.18] |
| p-value | 0.00 | 0.00 | 0.00 | 0.01 | 0.95 |
| Studies | 13 | 3 | 7 | 1 | 2 |
| N | 54,443 | 16,558 | 33,383 | 3,255 | 1,247 |
| *No Excuses Charter Schools Only* | | | | | |
| ELA | | | | | |
| Grand Effect Size | 0.12 [0.08, 0.17] | 0.18 [0.03, 0.33] | 0.11 [0.05, 0.17] | 0.11 [0.02, 0.22] | |
| p-value | 0.00 | 0.02 | 0.00 | 0.02 | No estimates |
| Studies | 8 | 2 | 5 | 1 | |
| N | 15,788 | 1,399 | 11,435 | 2,954 | |
| Math | | | | | |
| Grand Effect Size | 0.26 [0.21, 0.31] | 0.21 [0.70, 0.36] | 0.29 [0.23, 0.35] | 0.18 [0.05, 0.31] | |
| p-value | 0.00 | 0.00 | 0.00 | 0.01 | No estimates |
| Studies | 8 | 2 | 5 | 1 | |
| N | 15,714 | 1,119 | 11,685 | 2,910 | |

*Note*: Columns 2 through 5 are mutually exclusive and are summarized by the grand effect size estimates reported in column 1. There are no studies of No Excuses schools that did not disaggregate their ITT estimates. Values in brackets represent the lower and upper bounds of the associated 95% confidence interval.

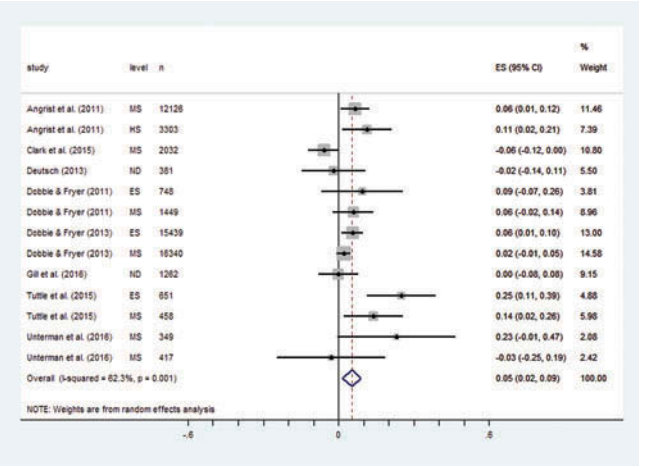


**Figure A1.** ITT estimates of the effects of charter schools on ELA achievement.
*Note*. ES = elementary school; MS = middle school; HS = high school; ND = findings not disaggregated by grade-level.

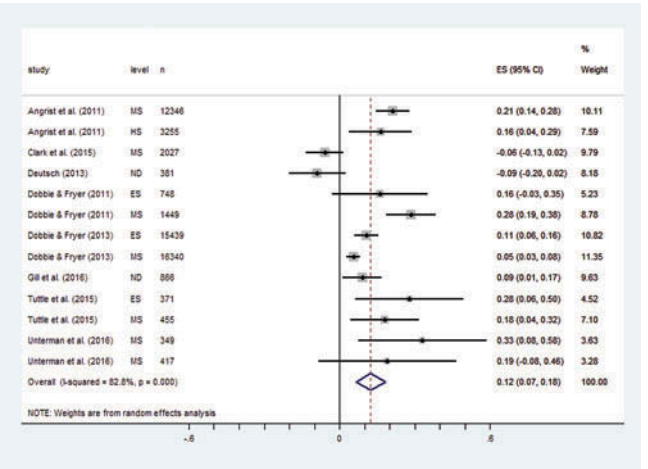


**Figure A2.** ITT estimates of the effects of charter schools on math achievement.
*Note*. ES = elementary school; MS = middle school; HS = high school; ND = findings not disaggregated by grade-level.

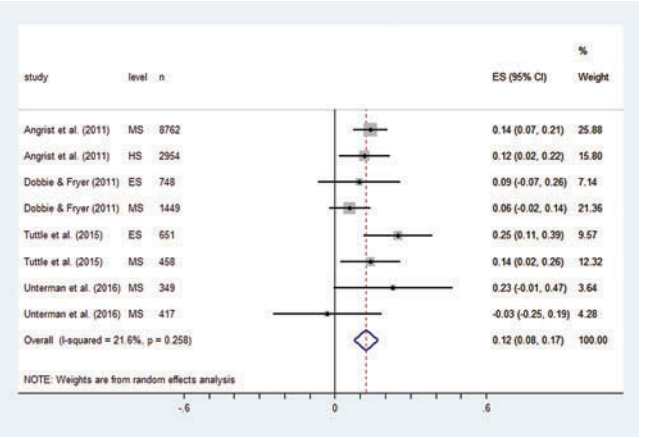


**Figure A3.** ITT estimates of the effects of No Excuses charter schools on ELA achievement. *Note*. ES = elementary school; MS = middle school; HS = high school; ND = findings not disaggregated by grade-level.

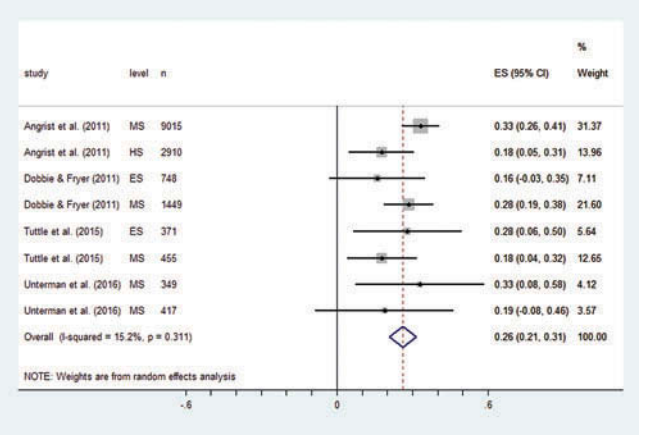


**Figure A4.** ITT estimates of the effects of No Excuses charter schools on math achievement. *Note*. ES = elementary school; MS = middle school; HS = high school; ND = findings not disaggregated by grade-level.