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REVIEW OF *SPECIAL EDUCATION AND ENGLISH LANGUAGE LEARNER STUDENTS IN BOSTON CHARTER SCHOOLS*

Reviewed By

Julie F. Mead, University of Wisconsin-Madison
Mark Weber, Rutgers University

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Summary of Review

A recent report investigates the enrollment and achievement of students with disabilities and students with English language learning (ELL) needs in oversubscribed charter schools in Boston. The report concludes that Boston charters and Boston Public Schools enroll similar numbers of both special populations and that charter attendance has a positive statistically significant effect for those who enter Boston's charter school lottery and then enroll after being offered a seat. This review finds that econometric models used to estimate the effects are appropriate, but also more limited than the report would suggest. The report finds some interesting patterns that deserve further study; however the effects cannot be generalized to charter schools outside Boston or even to most students inside Boston. The study also offers no context to compare the size of reported gains and it does not adequately examine how or why the reported test score gains are realized; for example, it does not account for peer effects or spending differences. Ultimately, while this report takes an important step in studying how oversubscribed charters may affect the academic achievement of special needs students, a closer examination is needed in order to accurately inform those making education policy.



Kevin Welner
Project Director

William Mathis
Managing Director

Alex Molnar
Publishing Director

National Education Policy Center

School of Education, University of Colorado
Boulder, CO 80309-0249
Telephone: (802) 383-0058

Email: NEPC@colorado.edu
<http://nepc.colorado.edu>

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<http://www.greatlakescenter.org>
GreatLakesCenter@greatlakescenter.org

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Julie F. Mead, University of Wisconsin-Madison
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I. Introduction

This review considers the recent report released by the School Effectiveness and Inequality Initiative (SEII) entitled, *Special Education and English Language Learner Students in Boston Charter Schools*.¹ The study examines “whether and how well charter schools serve special education and English Language Learners.” In particular, the study examined a group of Boston charter schools in order to better understand whether charter schools enrolled these special populations of students in patterns similar to or different from traditional public schools. Relying on econometric techniques, the report analyzes lottery data obtained from a total of 30 Boston charter schools. That is, the study focused on those charter schools that received more applicants than they could admit, which required the school to use a lottery to select which students to enroll and which to deny enrollment. Statistical comparisons were then made between those students selected and those rejected for the school years beginning in 2003-2004 and ending in 2014-2015.

Then using individual student data from the Massachusetts’ Student Information Management System (SIMS), the study collected data depicting student test performance on the Massachusetts Comprehensive Assessment System (MCAS), the English Proficiency Exam, and students’ demographic characteristics. For the five high schools in the study, students’ SAT and AP data were also examined. Finally, school staffing data were obtained for the 2007-08 through 2013-2014 school years from the Massachusetts Education Personnel Information Management Systems (MEPIMS) in order to calculate staffing level comparisons between charter schools and traditional schools.

The study reports that “special education and ELL students experience large academic gains in charters, similar to the gains of non-special needs students” (p. 1). Results presented indicate that “charters remove the special education status of those with classifications ... more than traditional public schools” and likewise de-classifies ELL students more often (p. 1). Finally, the study finds that students with disabilities are more likely to be placed in instructional settings with their non-disabled peers in charter schools, rather than removed for specialized instruction (p. 2). In total, the study claims to “debunk” the “common perception that charters underserve special education and ELL students” (p. 18).

This study considers an important research question concerning the students who enroll in

charter schools. The report appears to have been at least partially motivated (p. 1) by the call for more research from the U.S. Government Accountability Office, which reported in 2012 that charter schools tend to enroll smaller numbers of children with disabilities.² It is laudable that the study employs student level data over multiple years. It is also commendable that it examines both students with disabilities and those who are learning English. As will be discussed below, however, the study's methods and the assumptions that undergird it justify caution when reading the results, particularly for those involved in charter policy formation. In particular, the study does not adequately explain some of the approaches used and understates the limitations of those approaches.

II. Findings and Conclusions of the Report

As noted above, the study focused on two special populations of students: a) students with disabilities (SWD) and b) students with English Language learning needs (ELL). The paper's abstract summarizes the major findings of the study as follows:

Charter attendance effects on test scores are positive and similar for special needs and non-special needs students. Charters also increase the likelihood that special needs students meet high school graduation requirements and earn a state merit scholarship. Even the most disadvantaged special needs students benefit from charter attendance. Charter schools also remove special needs classifications and move students into more inclusive classrooms at a substantially higher rate than traditional public schools. Differences in charter classification practices are largely unrelated to charter gains, suggesting that special needs classification is not essential for disadvantaged students to make progress (abstract).

The data collected and the patterns discussed raise numerous questions for further study. The report also demonstrates both the complexities and the limitations of using econometric techniques to investigate charter schools' treatment of children with disabilities and those who require English Language instruction. For example the study ably shows that understanding these special populations requires attention to numerous details, including classification patterns, severity of educational need, and staffing patterns. However, as discussed below, even with this attention to detail, some of the claims mask the complexities of actual practice, which may not accurately capture the phenomenon being studied.

III. The Report's Rationale for Its Findings and Conclusions

The School Effectiveness and Inequality Initiative (SEII) report, like other research that has used Boston's charter lottery as a natural experiment to study the effects of charter schools,³ uses an instrumental variables (IV) method to determine the causal effects of charter school attendance on test scores. IV is well-known among quantitative researchers and is consid-

ered a standard methodology; however, its conceptual framework and limitations must be understood before policy makers can draw conclusions.

IV's primary purpose is to mitigate against the effects of *endogeneity*⁴ – the “causal looping” that can render a standard regression-based analysis meaningless. In this case, the endogeneity problem stems from the likelihood that the same traits (such as parental engagement) that lead students to get better scores on standardized tests also make them more likely to enroll in a charter school if given the chance. This “omitted variable bias” (OVB) creates problems when attempting to assign a causal effect to enrollment in a charter school. For example, if students who are more likely to do well on tests enroll in charters at higher rates, it may be that the charters are simply “skimming the cream,” and not truly providing a more effective education.

We discuss the use of IV further in the Appendix. What is most important to understand, however, is that any effects from the SEII study can only be generalized to the population of students who actually enter the lottery. The report only acknowledges this limitation in its very last paragraph: “It is worth noting that the results apply to charter lottery applicants.... [M]y estimates may not reflect the effects of expanding the number of seats in Boston’s charter sector or requiring charters to recruit more special needs students” (p. 19). Waiting until the end of the paper to acknowledge this limitation, however, downplays its importance. To understand why this might be, imagine that the overenrolled charter schools in Boston require students and families to opt into extended school days or an extended school year. This additional instructional time is likely to increase test scores, but it is an approach

This study does NOT compare the overall performance of students enrolled in charter schools with those enrolled in traditional schools.

that may not be scalable to non-applicant families who do not want this extended school time. Or imagine that the overenrolled charter schools in Boston use instructional approaches and curriculum that engage only a subset of the student population; attempting to generalize such benefits to non-applicant families who are disinterested in those approaches would not be warranted.

The only endogeneity problem the study’s method can address is the causal loop created by the unmeasured characteristics of students that make them more likely to score well on tests and more likely to enroll in a charter school *after they have been offered a seat*. But there is another, arguably larger issue: students who have those same unmeasured characteristics may be much more likely to enter the charter lottery in the first place.

Figure 1 shows the pathways that the study sample students follow on their way to charter or Massachusetts public district school enrollment, or to several other enrollment possibilities: enrollment in a private school, out-of-state, or a non-lottery charter. Only those students who are in the grey boxes are part of the study sample. Further, the two-stage least squares (2SLS) estimates generated by the IV method apply only to the effects on the “compliers”: the students who actually enroll in a charter when offered the slot and those who stay in Massachusetts public district schools when not offered charter admission.⁵ Policy makers

must remember that the effect sizes only apply to these subgroups, and cannot necessarily be generalized to any of the other sets of students. As such, this study does NOT compare the overall performance of students enrolled in charter schools with those enrolled in traditional schools. This limitation, by itself, is enough to warrant caution in the use of this study to justify changes in educational policy. There are, however, additional concerns.

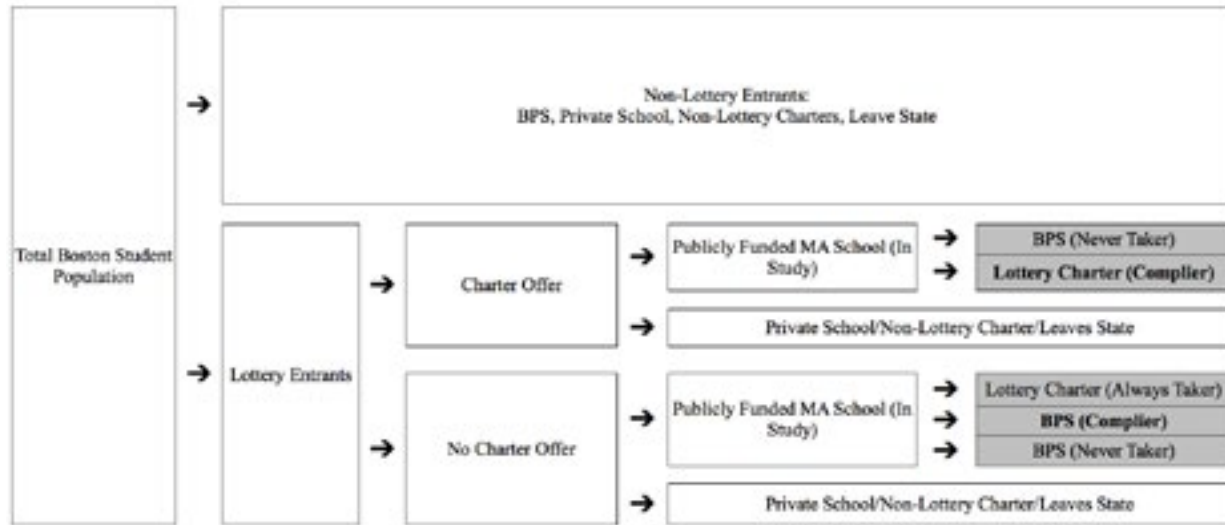


Figure 1 - Pathways Of SEII Study Participants and Other Boston Students

IV. The Report's Use of Research Literature

The SEII report does not deeply discuss the literature on either charter schools or special education and ELL classifications and practices. Several studies on ELL and special education reclassification are cited but not fully described or synthesized (p. 2). Two primary sources are given to describe the “No Excuses” pedagogy the report ascribes to Boston lottery charter schools, but neither of those sources presents the use of rigorous qualitative methods.⁶ The report cites three other studies that have used an instrumental variables method to estimate effect sizes in charter school lottery studies, but does not attempt a detailed synthesis of the results, content to say only that effect sizes show a “...strong positive relationship between the use of “No Excuses” practices and charter school gains...” (p. 2).⁷ Presumably this focus on “No Excuses” approaches stems from an assumption that the schools studied use this approach. Without citing actual numbers of schools or providing data to indicate the assertion was verified in the lottery schools studied, the report states that “Massachusetts urban charters are also characterized by the prevalence of No Excuses pedagogy (p. 3).⁸

This treatment of the literature basically omits studies that have addressed charter schools’ service to children with disabilities and those learning English, and it provides no discussion

to help the reader situate the report’s findings within the broader research on the topic.⁹

V: Methodology

As discussed earlier, the report relies on an IV method. In addition to the cautions raised earlier, this section discusses three other concerns: a) the report’s characterization of effect sizes; b) masking of individual school variations; and c) questions about the “treatment” being studied.

Effect Sizes

Repeatedly, the study characterizes the effect sizes produced by the IV estimates as “large” or “strong.” Table 1 in the Appendix summarizes the effect sizes from several tables in the SEII study; we discuss these differences in the Appendix. In this section, we examine the report’s characterization of the effect sizes. For example, the introduction presents the following description:

The results show that special education and ELL students experience large academic gains in charter schools: over 0.26 standard deviations in math and over 0.19 standard deviations on English on the state standardized exams. These gains are similar to those made by non-special needs students in charter schools (p. 1)

The difficulty in assessing this characterization is that the report provides no context for evaluating the size of the effects. Certainly, the estimates are statistically significant; but this result is as much a function of adequate sample sizes as it is of the size of the change in test scores that can be attributed to charter schools. How, then, does the report justify the claim that 0.26 standard deviations is “large”?

Previous charter school research has attempted to translate charter effects sizes into “days of learning.” We reject this method, and appreciate that the SEII study does not employ it.¹⁰ But some context is necessary to understand the *practical* significance of these estimates. To provide a possible framework, we present Figure 2, which shows the distribution of Massachusetts school-level scores on the Grade 8 English Language Arts (ELA) PARCC test for 2014-15. A total of 252 schools reported average scores on this test. The scores here have been standardized, meaning they have been converted to a common scale with a mean of 0 and a standard deviation of 1. It’s clear that the scores are roughly normally distributed, making the use of standard deviations to describe points along the distribution appropriate.

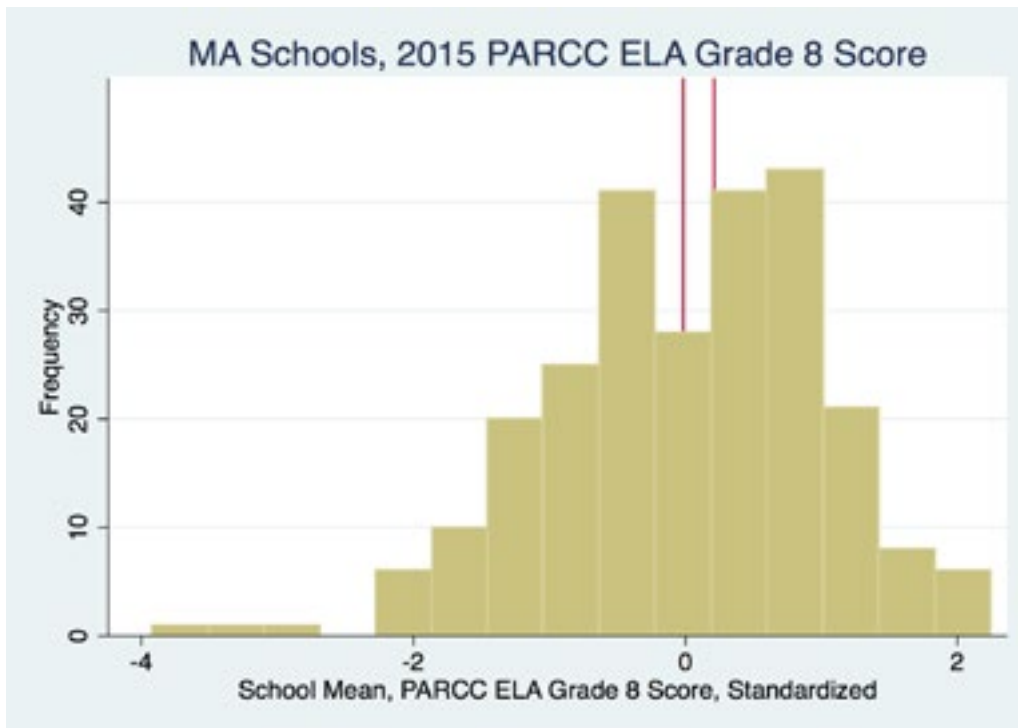


Figure 2 - Distribution of PARCC ELA Grade 8 Scores (Standardized) by School, Massachusetts, 2015

The two red lines represent two schools in our dataset: one whose score is almost exactly at the mean – the middle of our distribution – and another that is 0.23 standard deviations above.¹¹ The first school ranks 130 out of 252; the second ranks 112.¹² This is certainly an improvement; however, whether it is a “large” improvement depends on one’s perspective. The largest effect size the study reports using the 2SLS estimates is in elementary English: 0.478, which would move a school’s ranking from 130 to about 85. The smallest is in high school English: 0.148, which would move the ranking from 130 to about 122.¹³

Of course, the report may prefer other ways to describe the effect. That’s perfectly acceptable. What is less understandable is repeatedly describing an effect as “large” or “strong” with no context in which to judge the statement.

Individual School Variations

The SEII study design treats charter schools as a homogeneous whole; there is no reporting on effect sizes for individual charter schools, nor on how the enrollments of SWD and ELL students vary across the Boston charter sector. Some simple descriptions of the charters in this study, however, reveal there is substantial variation in student enrollments and, possibly, in effect sizes.

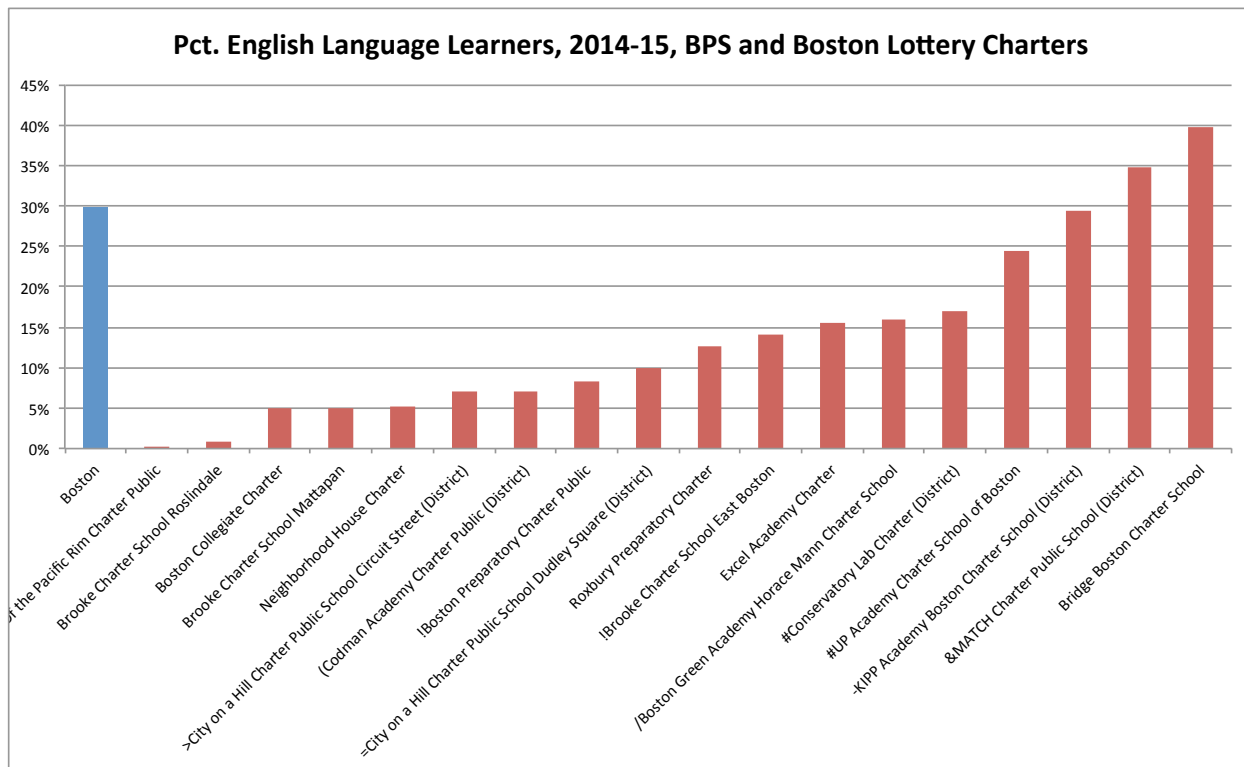


Figure 3: 2014-15 Selected Populations Report (District)
 Data source: http://profiles.doe.mass.edu/state_report/selectedpopulations.aspx

Figure 3 shows the ELL enrollments for BPS at the district level and for each of the charters in the study for the 2014-15 year.¹⁴ The majority of the charters do not enroll an equivalent percentage of ELL students when compared to BPS as a whole. The report asserts this difference is likely due to the charters’ practice of declassifying students at a higher rate than district public schools. But even the most generous estimates of charter declassification effects (37 percentage points greater in charter high schools; see Table 8 of the report) could likely not explain the disparate enrollment proportions for many of the charter schools studied. While declassification is a plausible theory worth investigating further for some of the charters, the heterogeneity of the group suggests some are simply not places where large numbers of ELL students are enrolled.

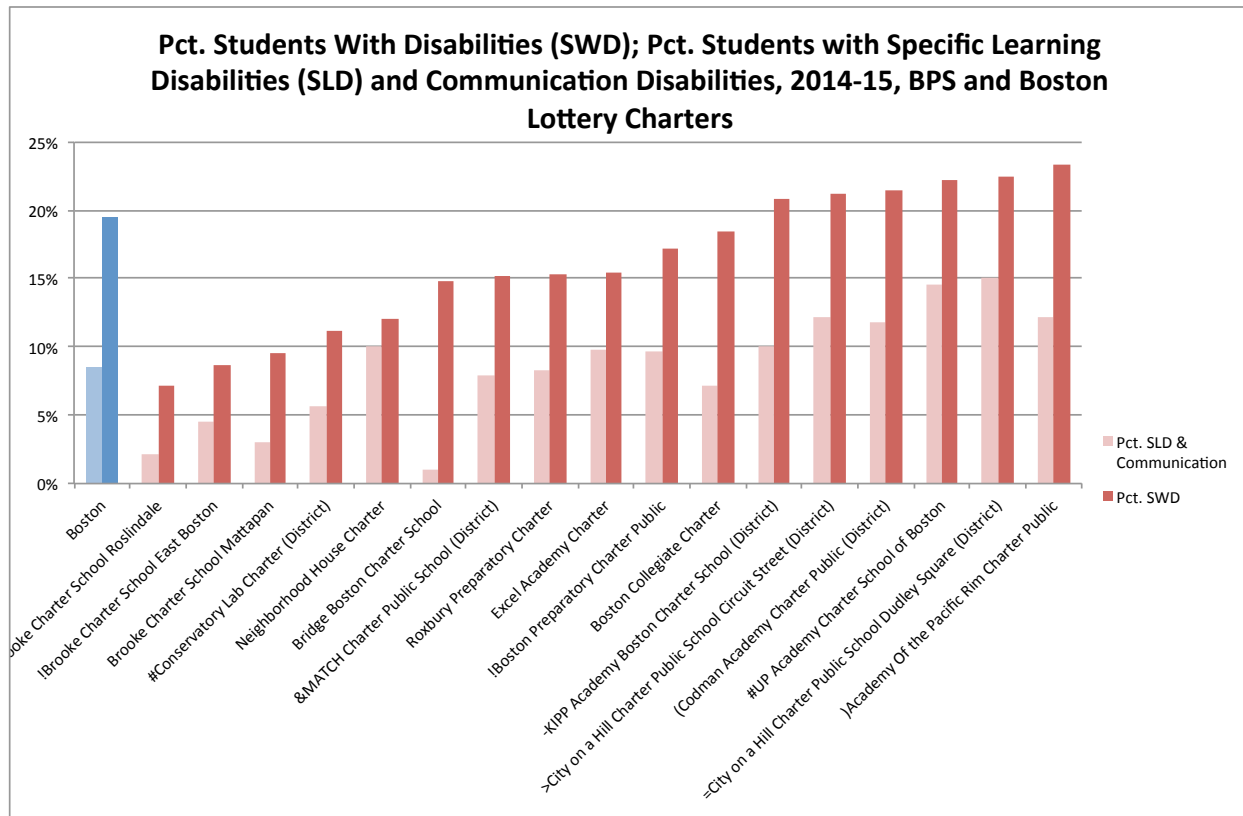


Figure 4

Data source: <http://www.doe.mass.edu/infoservices/reports/enroll/default.html?yr=sped1415>

Figure 4 shows the enrollments for SWDs in the same year. The disparity between BPS and the charters is less pronounced than with ELL students; in fact, quite a few charters have higher SWD enrollments. However, several charters fall far below BPS in enrolling SWDs. Again, it is unlikely even the most generous estimates of declassification could explain these differences.

In addition, this graph looks at what percentage of the total student population is classified with either a specific learning disability (SLD) or a communications disability (referred to in federal regulations as speech or language impairment). These two categories of disability are considered to be lower-cost than other disabilities.¹⁵

For many charters, these lower-cost disabilities account for a greater proportion of their total SWD enrollment than BPS. Figure 5 shows the proportion of BPS and charter SWDs who are classified in SLD or communications.

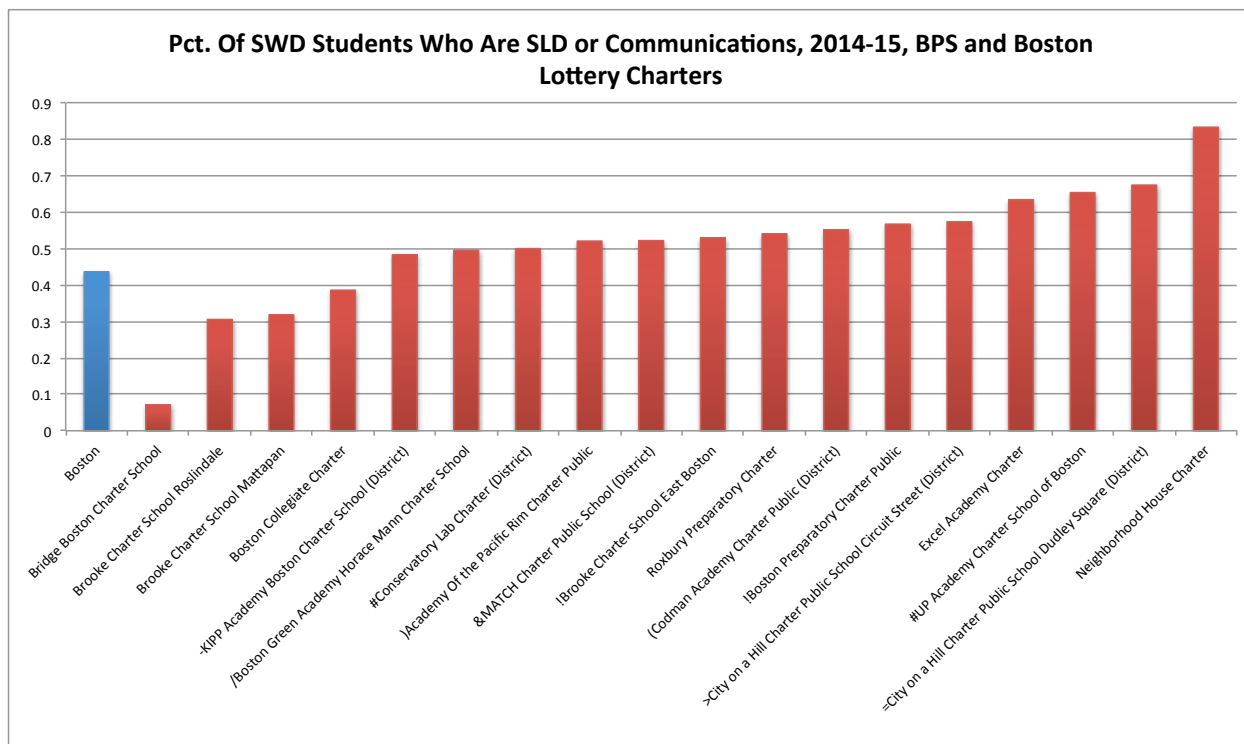


Figure 5

Data source: <http://www.doe.mass.edu/infoservices/reports/enroll/default.html?yr=sped1415>

The higher proportion of students with low-cost disabilities in some of the charters suggests they are not serving equivalent SWD populations to BPS as a whole.

Certainly, some charters serve greater numbers of ELLs and SWDs than BPS. But even a cursory look at the current enrollments reveals the issue has far more complexities than the study addresses. There is significant heterogeneity in ELL and SWD enrollments among the charters, and many are enrolling larger populations of students with low-cost disabilities.

The report also attempts to examine the severity of disabilities served in charter schools. It does so by using the proxy of placement, making the assumption that students who require services outside the traditional classroom have more severe disabilities. Such an assumption may or may not be true for individual children, but it does seem to be a reasonable place to start. The report then compares students across three broad placement bands used by the Massachusetts Department of Education:¹⁶ 1) “full inclusion” – those students who are removed from the general education setting to receive special education services 0-20% of the school week; 2) “partial inclusion” – those students who removed from the general education setting to receive special education services 21-60% of the school week; and 3) “substantially separate” – those students who are removed from the general education setting to receive special education services 61-100% of the school week. The report claims that

charter schools are more likely to have children in inclusive settings and enroll comparable numbers of children are placed in “partial inclusion” or “substantially separate” settings (p. 12-13).¹⁷

While addressing severity is important and is a welcome addition to the analysis, caution should be used when interpreting the results. First, the placement bands are very broad. For example, the “partial inclusion” category would include a student who is removed from the classroom for 5.88 hours of a 28-hour school week¹⁸ as well as a student who is removed 16.8 hours of a 28-hour school week. Clearly the latter student would require more specialized instruction and incur considerably more expense than the former. This report’s analysis does not have the precision to report whether charter schools have sufficiently similar students within each band. Second, the analysis does not take into consideration that learning environment has an effect on how a disability manifests itself. If charter schools tend to have fewer students per classroom, the ability of the teacher to “include” the student with a disability would be enhanced as would the likelihood that the child’s disability no longer requires special education in order to receive an appropriate education.¹⁹ We stress here that smaller class size is beneficial and this situation would be consistent with the report’s findings, but the key policy implication would favor class size reduction policies, not necessarily charter expansion.²⁰

The study also reports that selected lottery students with disabilities are less likely to keep their disability classification than the comparative group of lottery entrants who remained in BPS. As noted above, such a pattern could stem from contextual issues that have little to do with sector differences or even pedagogical approaches. Likewise, no data are provided concerning the frequency for classification changes in BPS as a whole. Therefore, the report provides no evidence that charters change SWD disability classifications any more than BPS. Yet, regardless of this problem and the others noted in this section, the study claims it “debunks” the perception that charters underserve SWDs (p. 18).

Treatment

The differences in individual charter enrollment characteristics brings up an important question: what, exactly, is the treatment in this study? In other words, can the gains be attributed to the governance structure (charter v. non-charter) or is it actually some other mechanisms (peer effects, spending differences, staff-to-student ratios, methods used) that account for the gains? The report provides evidence that charter schools students, including SWDs and ELLs, attend schools with more staff per student, likely leading to smaller class sizes.²¹ The evidence presented about the lower levels of ELL and special education staff compared to public district schools is interesting and well worth considering, as is the observation that charter students tend to lose ELL or SWD classifications more than district school students.

But the deployment of staff may be less important for policy purposes than the number of staff. How do Boston’s lottery charters afford to maintain higher staff-student ratios than BPS? Several research reports have suggested that administrative costs are higher at

charters than public schools,²² but charters might still maintain higher staff-student ratios by hiring relatively inexperienced teachers, who tend to make lower salaries than district teachers.²³ In addition, some charter management organizations have been shown to spend more per student thanks to substantial philanthropic contributions, which could help raise staff-student ratios.²⁴ If higher staff-to-student deployment is the actual treatment – and not the pedagogical or disciplinary practices of the charters – this would be important for policy makers to understand.

In the same way, peer effects have been found to be contributors that affect student outcomes.²⁵ The report provides graphs that outline changes in SWD and ELL enrollments in BPS and the charters; however, no attempt is made to quantify whether those changes had any effect on test scores. While it is arguably difficult to control for peer effects in a study of this nature, previous studies of Boston lottery charters have used covariates for peer characteristics in their models.²⁶ Certainly, the SEII study raises interesting questions about whether the staff deployment practices in charters affect test scores. Further research on other factors, such as the effects of peers and spending differences, is warranted before policy makers will have sufficient information to act.

VI: Review of the Validity of the Findings and Conclusions

The SEII study does show a statistically significant effect for ELL and special education students who enter in Boston’s charter school lottery and then enroll after being offered a seat. The econometric models used to estimate the effects are appropriate but limited. The effects can only be generalized to those students who enter the lottery and comply with their assignment to either treatment (charter school) or control (district public schools). What is far less clear, however, is whether these effects are practically significant. Compared to the distribution of average test scores across Massachusetts schools, the effects shown in this study do not appear to be particularly large; however, it is difficult to properly evaluate these effect sizes without comparing them to the effects of other policy interventions on the academic achievement of SWD and ELL students.

Further, the study does not put to rest important questions about *how* these test score gains are realized in Boston lottery charter schools. The research on whether a “No Excuses” pedagogy affects test scores is extremely limited to begin with, and this report does not describe qualitatively any causal mechanism through which ELL or special education students benefit from that pedagogy. The report also asserts, “Charters also utilize data-driven methods, which enables them to identify and provide support to struggling students...” (p. 18), but it does not provide any evidence that demonstrates these methods are any different than those found in public district schools or if they are effective in either setting. Spending differences and peer effects are not accounted for at all. The report raises interesting questions about staff deployment and staff-student ratios; however, it is premature to suggest that the lottery charters have discovered staff deployment practices that could be generalized to BPS

schools.

VII: Usefulness of the Report for Guidance of Policy and Practice

The SEII study makes a significant initial contribution to the literature. The effects of charter schools on the learning outcomes of special education and ELL students is an important topic that has not been adequately addressed.

Ultimately, however, this report lends only slight evidence to support the current advocacy for charter school expansion, in Boston or elsewhere. Moreover, the study should be understood together with other relevant research. There is, for example, significant evidence that charter schools have pernicious effects on their host districts' finances.²⁷ There is growing evidence that charter schools may engage in rent-seeking and other activities that are an unnecessary burden on the fiscal capacity of school systems.²⁸ Recent court cases raise concern that student rights may be abrogated by charter schools;²⁹ this is of particular concern for special needs students and their families, who may need to avail themselves of due process rights at greater rates than other students. Similarly, research has cautioned that charter schools appear to produce racially homogenous schools.³⁰ These concerns may well outweigh the arguably modest practical effects of charter schools on Boston's special education and ELL students' outcomes found in the SEII study.

Further, this report does not provide nearly enough evidence to support changing BPS's – or any other public school district's – special needs practices. The inability to generalize the results found in this study to any population other than those students who enter the lottery and comply with their treatment assignments greatly limits how the report should inform the decisions of policy makers. That is not to say this report does not provide important information; only that there is still much research needed in this area.

Appendix: Instrumental Variables Estimation in Charter Lottery Studies

As stated above, several studies have used instrumental variables (IV) methods to estimate the effects of charter schools that are oversubscribed and must use lotteries to offer seats to students. It is important to state once again, however, that IV cannot account for unobserved variables between students who do and do not enter a charter school lottery; in other words, the effects found in these charter lottery studies can only be generalized to those students who enter the lottery, and not to the entire population of students. This presents a serious threat to these studies' external validity: if the unobserved characteristics that make a student want to enter the lottery are the same characteristics that lead them to get higher test scores – family support, intelligence, perseverance, etc. – there is a bias in the estimations of charter schools' effect.

The lottery studies, then, can only estimate charter schools' effects on those students who choose to enter the lottery. But there are two other issues: (1) oversubscribed schools likely differ from undersubscribed schools in important ways; and (2) not all students comply with their lottery assignment. As we saw in Figure 1, some students who are not offered a lottery seat leave Massachusetts public schools altogether, enrolling in private schools³¹ or moving out of state. Some students who are offered a charter seat choose to remain in the public district schools. The characteristics that make a student choose to either accept or decline treatment could also be a form of omitted variable bias that could impact the validity of the estimations in an Ordinary Least Squares (OLS) regression.

IV is a method that attempts to correct for this bias (but, again, *not* for the bias that keeps us from generalizing to those who do not enter the lottery). By *instrumenting* the variable in question – charter school enrollment or years spent in a charter school – with the lottery outcome, researchers can credibly assert that they have mitigated against the problem of endogeneity. Because the lottery outcome cannot be affected by the student, it is *exogenous*; therefore, the causal “push” of the IV estimate is *monotonic*, or moves in only one direction.

The mechanics of IV estimation have been explained by many well-respected education researchers who use econometric methods.³² The most common method, and the one used in the SEII report, is *two-stage least squares* (2SLS). We won't go into detail here on how the models are constructed; suffice to say that the 2SLS estimates will differ from the OLS instruments based on how many subjects actually comply with their assignment to treatment. Further, the 2SLS estimates are generalizable only to the population of “compliers”: those who actually follow their assignment to a charter or a BPS school.

This raises a critical point: the OLS and 2SLS estimations differ only in how the instruments affect the model; in other words, how subjects comply with their treatment changes the estimates of the effect of charter schools when employing 2SLS. If the subjects were perfect compliers, there would be no need for the IV estimation. As the author explains:

The Ordinary Least Squares (OLS) estimates (shown in Table A6) have comparable esti-

mates to the 2SLS. This suggests that the OLS is unbiased. Therefore, there is not significant selection into complying with the results of the lottery: accepting a charter offer if it is received and not attending a charter if the student does not receive an offer. (p.9)

But is this actually so? Are the OLS and 2SLS estimates really comparable? If not, this would suggest there is, in fact, selection into complying with the lottery results—and the estimates could only be generalized to those students who comply with treatment.

Table 1 shows the OLS, 2SLS and Intent to Treat (ITT)³³ estimates. In some cases, the difference between the OLS and 2SLS estimate is relatively small: middle school special education math and English, for example. But there are other effects that are much larger; effect size changes greater than 0.1 standard deviations are bolded. As we note above, the author states that 0.26 SDs in math and 0.19 SD in English are “large academic gains.” These differences are arguably of the same scale; in the case of high school ELL math and English, they are *larger* than the gains highlighted by the author.

Table 1 - Effect Sizes of SEII Study by Model

		OLS	2SLS		ITT	
Special Education		Effect	Effect	Diff. From OLS	Effect	Diff. From OLS
Elem	Math	0.25	0.309	+0.059	0.444	+0.194
Elem	English	0.337	0.478	+0.141	0.694	+0.357
MS	Math	0.231	0.243	+0.012	0.202	-0.029
MS	English	0.186	0.172	-0.014	0.159	-0.027
HS	Math	0.229	0.223	-0.006	0.154	-0.075
HS	English	0.194	0.148	-0.046	0.108	-0.086
ELL						
Elem	Math	0.2	0.386	+0.186	0.587	+0.387
Elem	English	0.194	0.36	+0.166	0.528	+0.334
MS	Math	0.276	0.307	+0.031	0.231	-0.045
MS	English	0.22	0.2	-0.020	0.147	-0.073
HS	Math	0.105	0.414	+0.309	0.26	+0.155
HS	English	0.14	0.423	+0.283	0.272	+0.132
Non-Special Needs						
Elem	Math	0.089	0.184	+0.095	0.461	+0.372
Elem	English	0.108	0.199	+0.091	0.498	+0.390
MS	Math	0.197	0.255	+0.058	0.248	+0.051
MS	English	0.137	0.142	+0.005	0.13	-0.007
HS	Math	0.168	0.342	+0.174	0.199	+0.031
HS	English	0.128	0.215	+0.087	0.129	+0.001
Differences > 0.1 in bold						

Again: it is debatable whether these gains are *practically* significant. But it strikes us as inconsistent to assert that the charter effects are “large” in one context, while differences in effects between different models of the same magnitude are “comparable” in another. In any case, policy makers should be aware of these issues before citing to lottery studies such as this one when informing decisions.

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- 3 Abdulkadiroğlu, A., Angrist, J.D., Dynarski, S.M., Kane, T.J., & Pathak, P.A. (2011). Accountability and flexibility in public schools: Evidence from Boston's charters and pilots. *The Quarterly Journal of Economics*, 126(2), 699-748.

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- 4 Murnane and Willett describe an endogenous assignment to treatment as "... a result of actions by participants within the system being investigated..." (Murnane, R.J. & Willet, J.B. (2011). *Methods matter; Improving causal inference in education and social science research*. Oxford University Press; New York. p.32). In the SEII study, participants who are granted a seat at a lottery charter can choose whether or not to accept the seat. This means that treatment is not fully random; therefore, treatment and control groups are arguably not equivalent.
- 5 Angrist, J.D., & Pischke, J.S. (2009). *Mostly harmless economics; An empiricist's companion*. Princeton, NJ: Princeton University Press.
- 6 Carter, S.C. (2000). *No Excuses: Lessons from 21 High-Performing, High-Poverty Schools*. Washington, DC: Heritage Foundation. This publication is essentially a catalog of 21 schools chosen ostensibly because at least three-quarters of their students qualify for free lunch yet score above the 65th percentile on a national standardized test. No sampling methodologies are documented, no qualitative validity methods are described, and the tests are not consistent across all schools.

Thernstrom, A., & Thernstrom, S. (2003). *No Excuses: Closing the Racial Gap in Learning*. New York: Simon and Schuster. This book has two chapters devoted to "great schools," yet documents no sampling methodologies, no qualitative validity checks, no observation or interview protocols, and no coding methods.
- 7 The IV research cited was published in peer-reviewed economics journals. Missing from the report is any reference to studies that examine charter school performance using other research methods or studies reported in peer-reviewed educational journals.
- 8 The report cites a 2011 report for this assertion: Abdulkadiroğlu, A., Angrist, J., Dynarski, S., Kane, T.J., & Pathak, P. (2011). Accountability and flexibility in public schools: Evidence from Boston's charters and pilots. *The Quarterly Journal of Economics*, 126(2), 699-748.

For additional information about "No Excuses" other than that cited in the report, see, for example:

Golann, J.W. (2015). The paradox of success at a no-excuses school. *Sociology of Education*, 88(2), 103-119.

Powers, J. (2015, January). Review of No Excuses Charter Schools <http://nepc.colorado.edu/thinktank/review-no-excuses-charter-meta-analysis>

- 9 See for example: Blackwell, W.H. (2013). An era of charter school expansion: An examination of special education in Massachusetts' charter schools. *Journal of Disability Policy Studies*, 24(2), 75-87.

Buckley, J. & Sattin-Bajaj, C. (2011). Are ELL students underrepresented in charter schools? Demographic trends in New York City, 2006-2008. *Journal of School Choice*, 5, 40-65.

Garcy, A.M. (2011). High expense: Disability severity and charter school attendance in Arizona. *Education Policy Analysis Archives*, 19(6), 1-30.

Estes, M.B. (2004). Choice for all? Charter schools and students with special needs. *The Journal of Special Education*, 37(4), 257-267.

- 10 Di Carlo, M. (2012). *Do Top Teachers Produce "A Year And A Half Of Learning?"* Retrieved January 27, 2016 from <http://www.shankerinstitute.org/blog/do-top-teachers-produce-year-and-half-learning>

Weber, M. (2015). *Charter Schools, An Exchange: Part IV*. Retrieved January 27, 2016 from <http://jersey-jazzman.blogspot.com/2015/10/charter-schools-exchange-part-iv.html>

- 11 We could place the two schools at different points in the distribution. Putting them at the middle, however, allows for the most generous interpretation of changes in ranks.

- 12 The median ranking is not precisely 126 because of ties.

- 13 Of course, there are different numbers of elementary schools and high schools in Massachusetts than middle schools, so the actual ranks would not be equivalent to the ranks for middle schools. We only present this as an illustration of how relatively large or small effect sizes are.

- 14 Figures 3, 4 and 5 use "district-level" data: all Boston Public Schools are aggregated, as are different campuses for each lottery charter operator.

- 15 Chambers, J.G., Kidron, Y., & Spain, A.K. (2004, May). Characteristics of high-expenditure students with disabilities. Special Education Expenditure Project, Report 8. Washington, DC. Retrieved January 27, 2016 from <http://csef.air.org/publications/seep/national/Rpt8.pdf>

Augenblick, Palaich, and Accosiates (2011, October). Analysis of New Jersey's census-based special education funding system. New Jersey Department of Education. Retrieved January 27, 2016 from <http://www.edlaw-center.org/assets/files/pdfs/issues-special-education/NJ%20SPECIAL%20ED%20FUNDING%20FINAL%20REPORT%20OCT%202011.pdf>

- 16 See, Massachusetts Department of Education, Educational Environment/Placement. Available at http://www.doe.mass.edu/sped/iep/forms/pdf/PL2_6-21.pdf

- 17 The report asserts incorrectly that "Schools are required to re-evaluate students' classification and level of services every three years" (p. 3). Federal law requires that a child's disability status must be re-evaluated every three years (20 U.S.C. § 1414(a)(2)(B)(ii)), but the child's services and placement must be re-considered on an annual basis (20 U.S.C. §1414(d)(4)(A)(i)).

- 18 The Massachusetts Department of Education uses a 28-hour school week in its examples. Massachusetts

Department of Education, Educational Environment/Placement. Available at http://www.doe.mass.edu/sped/iep/forms/pdf/PL2_6-21.pdf

- 19 A “child with a disability” under the Individuals with Disabilities Education Act (IDEA) is defined as a child “with intellectual disabilities, hearing impairments (including deafness), speech or language impairments, visual impairments (including blindness), serious emotional disturbance ..., orthopedic impairments, autism, traumatic brain injury, other health impairments, or specific learning disabilities; and (ii) who, by reason thereof, needs special education and related services” (20 U.S.C. 1401(3)(A)). Regulations add the requirement that the disability “adversely affects a child’s educational performance” (34 C.F.R. 300.9). So a child with a disability whose needs can be met without special education is by definition no longer a “child with a disability” as defined by the IDEA.
- 20 Shin, Y. & Raudenbush, S.W. (2011). The causal effect of class size on academic achievement: Multivariate instrumental variable estimators with data missing at random. *Journal of Educational And Behavioral Statistics*, 36(2), 154-185.
- 21 The study does not actually report class sizes. Rather, it reports data indicating that charter schools have higher staff to student ratios (see Table 9 of the report).
- 22 Arsen, D.D., & Ni, Y. (2012). Is administration leaner in charter schools? Resource allocation in charter and traditional public schools. *Education Policy Analysis Archives*, 20, 31.

Miron, G., & Urschel, J.L. (2010, June). *Equal or Fair? A Study of Revenues and Expenditures in American Charter Schools*. Boulder and Tempe: Education and the Public Interest Center & Education Policy Research Unit. Retrieved July 20, 2015 from <http://nepc.colorado.edu/files/EMO-RevExp.pdf>
- 23 Burian-Fitzgerald, M. (2005). *Average teacher salaries and returns to experience in charter schools*. National Center for the Study of Privatization in Education. Retrieved January 27, 2016 from http://www.ncspe.org/publications_files/OP101.pdf
- 24 Baker, B.D., Libby, K., & Wiley, K. (2012). Spending by the Major Charter Management Organizations: Comparing charter school and local public district financial resources in New York, Ohio, and Texas. Boulder, CO: National Education Policy Center. Retrieved January 27, 2016 from <http://nepc.colorado.edu/publication/spending-major-charter>
- 25 Sacerdote, B. (2011). Peer effects in education: How might they work, how big are they and how much do we know thus far? *Handbook of the Economics of Education*, 3, 249-277.
- 26 Angrist, J.D., Cohodes, S.R., Dynarski, S.M., Pathak, P.A., & Walters, C.R. (2013). *Stand and Deliver: Effects of Boston’s Charter High Schools on College Preparation, Entry, and Choice (No. w19275)*. National Bureau of Economic Research.
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Arsen, D., & Ni, Y. (2012). The effects of charter school competition on school district resource allocation. *Educational Administration Quarterly*, 48(1), 3-38.
- 28 Baker, B. & Miron, G. (2015). *The Business of Charter Schooling: Understanding the Policies that Charter Operators Use for Financial Benefit*. Boulder, CO: National Education Policy Center. Retrieved January 27, 2016 from <http://nepc.colorado.edu/publication/charter-revenue>

- 29 Green, P.C., Baker, B.D., & Oluwole, J. (2014). Having it both ways: How charter schools try to obtain funding of public schools and the autonomy of private schools. *Emory Law Journal*, 63(2), 303-337.
- Green, P.C., Frankenberg, E., Nelson, S.L., & Rowland, J. (2012, Spring). Charter schools, students of color and the state action doctrine: Are the rights of students of color sufficiently protected? *Washington and Lee Journal of Civil Rights and Social Justice*, 18, 253-275.
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- 30 Orfield, G. & Frankenberg, E. (2013). *Educational delusions? Why choice can deepen inequality and how to make schools fair*. Los Angeles, CA: University of California Press.
- Bifulco, R. & Ladd, H. (2007). School choice, racial segregation, and test-score gaps: Evidence from North Carolina's charter school program. *Journal of Policy Analysis and Management*, 26(1), 31-56.
- 31 Home schoolers would also not appear in this dataset.
- 32 Murnane, R.J. & Willet, J.B. (2011). *Methods matter; Improving causal inference in education and social science research*. New York, NY: Oxford University Press.
- Angrist, J.D., & Pischke, J.S. (2008). *Mostly harmless econometrics: An empiricist's companion*. Princeton, NJ: Princeton University Press.
- 33 "Intent to Treat" (ITT) is a model that looks at the effect of *assignment* to treatment, not actual compliance. In IV methods, this is also referred to as the *reduced form*.

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AUTHOR: Elizabeth Setren

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REVIEWER: Julie F. Mead, University of Wisconsin-Madison,
Mark Weber, Rutgers University

E-MAIL ADDRESS: jmead@education.wisc.edu,
mark.weber@gse.rutgers.edu

PHONE NUMBER: (608) 263-3405

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