The Efficacy of Private Sector Providers in Improving Public Educational Outcomes

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Abstract

School districts required under No Child Left Behind to provide supplemental educational services (SES) to students in schools that are not making adequate yearly progress rely heavily on the private sector to offer choice in service provision. If the market does not work to drive out ineffective providers, students will be less likely to gain through their participation in SES. We estimate SES provider effects in an urban school district that accounts for a significant share of participating students. Using four different estimation techniques, we identify variation in the effectiveness of different types of providers, as well as across specific providers, in increasing students' math and reading achievement. We expect this research to inform education policy, including the reauthorization of Title I and district tutoring interventions both under NCLB and following federal waivers from NCLB, and to generally address the viability of policy interventions that employ a private market model to improve public sector outcomes.

Keywords: Supplemental educational services, choice, effectiveness

Introduction

The U.S. No Child Left Behind (NCLB) Act was designed to increase the achievement of economically disadvantaged students by introducing greater choice, flexibility and accountability in public education. Key legislative provisions include offering educational choice to those in persistently low-performing schools; empowering parents with more information about the quality of their children's schools; holding states, districts and schools accountable for student achievement by identifying and imposing requirements on schools in need of improvement, and targeting federal funds on effective practices for improving teacher and school quality.[1] As in the decentralization of government functions in other policy areas (public assistance, publicly-funded training, child welfare, etc.), the expectation is that involving the private sector in public services delivery will bring about a more efficient, innovative, competitive, results-oriented and responsive public sector that better meets diverse public preferences, values and needs (Frederickson & Smith, 2003; Rivlin, 1992).

We study the NCLB provision that requires schools that are not making adequate yearly progress for three years to offer children in low-income families the opportunity to receive extra academic assistance (or tutoring), known as supplemental educational services (SES). The primary responsibility for implementing SES lies with school districts, which largely rely on the private sector to offer eligible students a range of choices for SES. NCLB obligates school districts to set aside 20 percent of their Title I funding for SES and lays out criteria and guidelines for state and local educational agencies in approving SES providers and arranging for their services.[2] Importantly, it requires state and local educational agencies

[1] See Title I, Section 1116(e) of the Elementary and Secondary Education Act (ESEA), reauthorized by the No Child Left Behind Act of 2001.

[2] Title I federal funding, which began in the 1965 Elementary and Secondary Act, was created to allow all students an equal opportunity to receive the highest quality education possible. Through Title I, school districts

to measure provider effectiveness in increasing student achievement and to use this information to withdraw approval of ineffective providers (Heinrich, 2010).

NCLB also directs school districts to determine eligibility for SES using the same information used for making within-district Title I allocations (such as free school lunch eligibility), and schools then notify families of their children's eligibility. If more eligible students sign up than there are funds available for serving them, districts establish additional eligibility criteria, frequently based on student special needs and academic performance. However, some eligible students do not follow through in registering for and attending SES, and others stop attending before their SES dollar allocation is expended. Therefore, selection into treatment (or who gets tutored in SES) and for how long is likely influenced by student characteristics, as well as program type and administration (Heinrich, Meyer and Whitten; Steinberg, 2011). This makes it enormously challenging for researchers, and even more so for school districts with limited resources, to identify effects of SES providers on student achievement, while controlling for the effects of other classroom and school interventions.

Chicago Public Schools (CPS) accounts for a disproportionately large share of the students eligible for SES in the U.S., and as we discuss further below, CPS has consistently made an effort to evaluate SES effects, including provider effectiveness. We use the most recently available longitudinal data from CPS—the 2007-08, 2008-09, 2009-10 and 2010-11 school years—to estimate provider-specific effects and the effects of different types of SES providers using alternative estimation techniques and subsamples and under differing

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can hire teachers to lower student-teacher ratios, provide tutoring for struggling students, create school computer labs, fund parent involvement activities, purchase instructional and professional development materials for teachers, hire teacher assistants, and more. The 20% Title I set-aside for SES and school transfers cannot be spent on administrative costs for these activities, although the district may reallocate any unused set-aside funds to other Title I activities after all eligible students have had adequate time to opt to transfer to another school or apply for SES.

assumptions about student and provider selection. Based on prior literature and our conceptual framework (discussed below), we hypothesize that there are positive effects of attending SES on the achievement of eligible students that will increase with hours attended; provider characteristics will be correlated with SES effectiveness, and some specific providers will be more effective than others in delivering SES and increasing student achievement.

We employ four alternative approaches to estimate the effects of SES and different type of SES providers on changes in student test scores, while controlling for student selection into SES and/or into different provider types. The SES provider types that we examine are: district vs. non-district providers, online provision, on-site vs. off-site providers, and for-profit vs. not-for-profit (nonprofit or public) provision.[3] We use gains in test scores as our outcome in school value-added, student fixed effects, school and student fixed effects, and propensity score matching models. We control for school and student time invariant characteristics using these four strategies. Each of these modeling approaches makes somewhat different assumptions about selection into SES, and as we are estimating different types of effects (e.g., provider-specific, provider-type), the analytical samples differ to some extent as well. Thus, while we look for overall consistency in the results, we expect some differences as well.

In general, we find that the CPS district provider delivers significantly more hours of tutoring to students who register to receive SES, and there appears to be strong linkage between hours of SES attended and increases in student achievement. In addition, the CPS district provider is an on-site provider, and we also find that SES delivered by on-site providers is effective in increasing student achievement. Students attending SES with online

[3] Online providers use computers/digital technology as the primary format/platform for delivering SES. On-site providers offer SES on a public school campus (and typically serve students attending that school), while off-site implies that the services are delivered at a site other than the school (e.g., home-based or other location in the community).

providers and for-profit providers gain less in reading and math as compared to other off-line and not-for-profit providers, respectively. We also identify a number of providers that consistently have positive and statistically significant effects on student achievement. Overall, while average effect sizes are small (approximately 0.09 in reading and 0.06 in math) relative to other educational interventions, there is some limited evidence that the SES program contributes to improving student achievement.

In the next section, we discuss our conceptual framework and some background information, followed by a review of the literature to date on SES effectiveness. We then describe the data and estimation approaches that we employ in the analysis of SES effects and present some descriptive statistics on the different types of SES providers and the characteristics of CPS students they serve. We follow with a discussion of the results of the estimation of SES effects for different provider types and specific providers in CPS and conclude with policy implications.

Conceptual Framework and Background

Consistent with broader public sector management trends and the classic market paradigm, an important component of recent initiatives to improve K-12 education effectiveness are efforts to introduce market-driven management and increase pressures on educational institutions to develop new strategies for improving student learning and educational outcomes. In the context of SES, measuring provider performance and disseminating information on provider effectiveness should foster a more competitive market for services; contribute to more informed student choices; encourage innovative approaches to service delivery as providers compete for market share, and squeeze out inefficient or ineffective providers through choice.

Indeed, a large number of diverse organizations with widely varying hourly rates, service costs, tutor qualifications, tutoring session length, instructional strategies, and curricula have entered the market to compete for the opportunity to provide SES. These include national and local organizations, for-profit and nonprofit providers, online and off-line providers, those offering services on-site at the schools (and off-site), and in some cases, schools districts engaging directly in SES provision. Burch, Steinberg and Donovan (2007: 121) described the market for SES as ``a very new market where hundreds of firms are flocking to take advantage of the promise of sizeable revenues." NCLB explicitly discourages states from taking any actions that might limit the supply of providers and range of choices available to parents.[4]

Private companies have long been involved in the delivery of K-12 public educational services, from textbooks and instructional supports to testing and evaluation, tutoring, and more. More recently, the increasing participation of for-profit entities in direct services provision through vouchers for school choice, charter schools and mandatory out-of-school time interventions has drawn criticism of the prospects for ``profiteering" in public education, where for-profit firms are viewed as willing to compromise on quality and to short-change students to better their bottom line (Horn, 2011). The primary opposing view counters that private firms have considerable potential to cultivate critically-needed innovation in educational practice; that is, they are more likely to have the capability and incentives to

[4] The guidance states (U.S. Department of Education, 2005, p. 7): [A state educational agency] that desires to set program design parameters should ensure that such parameters do not result in the inability of a wide variety of providers, including non- profits, for profits, [local educational agencies] and faith-based and community organizations, from being able to participate as eligible providers, thereby limiting parental choice.

rapidly expand successful practices and approaches, to attract the required financial and human capital, and to more cost-effectively deliver educational services.

In the context of this debate, Peterson (2003) recounts the compromise between Capitol Hill conservatives who supported vouchers as a key lever of accountability through choice, and liberal politicians who opposed the encroaching private sector role in K-12 public education that led to the creation of SES under NCLB. SES allowed for the ``back door'' entry of private providers-for-profit, nonprofit, secular and religious into public schools that were failing to make adequate yearly progress, while preserving an important role for school districts in arranging access for students to SES and in contracting with private providers. School districts identified as "in need of improvement" were, for the most part, prohibited from directly providing SES, on the premise that if they were not effective during the regular school day, they would be unlikely to do better after school. Private providers, alternatively, might benefit from the fact that SES is voluntary rather than compulsory, allowing them to potentially work with a more motivated group of students enrolling in an after school academic program. In addition, they are free to hire and fire teachers/tutors (unencumbered by the typical union rules) and have broad leeway in program structure, focus and curricular design.

School districts have assumed the major responsibility for disseminating information on SES providers approved by state educational agencies and operating in the district, although to date, this has largely consisted of provider *self-reported* information on their attributes and effectiveness (Heinrich et al., 2010). SES providers also market their services directly to parents and students. Some school district accountability and evaluation units have attempted to measure program and provider effectiveness with administrative and student

record data, as in Chicago Public Schools. They face important challenges, however, in properly evaluating student- and provider-level SES effects, given that participation in SES is voluntary among eligible students.

In general, school districts have few resources for monitoring SES providers and little leverage for dismissing them,[5] and they have criticized state educational agencies for their lack of responsiveness to reported problems with providers, including fraud and ineffectiveness. Chicago Public Schools has been particularly proactive in its efforts to disseminate available information to parents and school principals about SES provider effectiveness and to develop district policies that support monitoring of providers that use its school facilities for service delivery. Still, in the absence of accurate and fairly complete information on SES provider performance, states and districts have little capability or leverage for disciplining the market (i.e., sanctioning or disqualifying ineffective providers), and the benefits of choice in a competitive market are unlikely to be realized if the purchasers (eligible students or their parents) have inadequate information for choosing providers.

Review of Literature on SES Effectiveness

Previous research on out-of-school-time programs reports mixed findings on the effectiveness of these programs in improving student outcomes (Halpern, 2003; Little, 2007). Many after-school programs, particularly those with a greater focus on recreational than educational activities, have been shown to have minimal effects on students' academic progress (Hollister, 2003). SES, however, was designed to explicitly address students' educational needs, and the large literature on other after-school/tutoring programs confirms

[5] One of the few provisions available to districts for requesting removal of a provider is following a violation of a district policy in use of its buildings/space.

their potential to increase student achievement with sufficient hours of tutoring (Dynarski et al., 2004; Halpern, 2003; Lauer et al., 2006; Little, 2007; Vandell et al., 2005). Yet to date, little is also known about what types or attributes of SES programs are effective, and what policies at state or local level can maximize the potential benefits of SES for eligible students.

Early studies of SES effects on student achievement were primarily descriptive and focused on the challenges of implementing the services in an evolving market (Burch et al., 2007), while more recent studies have sought to empirically estimate the effects of SES on student achievement. Chatterji, Kwon and Sng (2006) estimate the effects of SES in one New York school and found small positive effects. Evaluations conducted by Chicago Public Schools (CPS) in 2003-04, 2004-05, 2006-2007 and Jones (2009) reported larger gains in reading and mathematics for students receiving at least 40 hours of tutoring and for students in grades 4-8 who were not English language learners and who received at least 30 hours of SES tutoring. A study by the Los Angeles Unified School District (Rickles & Barnhart, 2007) found fairly small program effects, attributed primarily to improved performance by elementary students. Studies in Minneapolis (Heistad, 2007) and Milwaukee Public Schools (Heinrich et al., 2010), where average SES hours attended are particularly low, did not find statistically significant, positive effects of SES participation. Zimmer and co-authors (2007) reported average increases in math test score gains of 0.09 standard deviations for students attending any SES across the eight sites in their study, and Springer, Pepper and Ghosh (2009) likewise estimated increases in test score gains of about 0.09 standard deviations in mathematics (and 0.076 standard deviations in reading). In an alternative specification that accounted for those who registered but did not attend SES, however, Springer et al. did not find statistically significant effects on reading for students attending SES. Springer et al.

caution that very few studies rigorously adjust for student selection into SES, identifying only four studies besides their own that did (Zimmer, 2006 and 2007; Heistad, 2007; Heinrich et al., 2010).

There are likewise few studies that rigorously examine the effects of specific SES providers on students' academic outcomes (Jones, 2009; Zimmer et al., 2007; Muñoz et al., 2008; Ross et al., 2008; Potter et al., 2006). This is especially problematic given that it was the explicit intent of NCLB to hold providers accountable by giving students and parents the necessary information on provider performance to exercise choice and realize the benefits of a competitive market for services.

Jones (2009) used multilevel modeling to explore SES provider effects on students who attended SES, controlling for student and school level characteristics.[6] He reported moderate effects of attending SES and positive effects of several individual providers in Chicago. Studies by RAND (2007) and Socias et al. (2009) used a difference-in-differences strategy with value added models to estimate SES provider effects across multiple districts after the introduction of district providers in 2006-07. The RAND study found that participation in SES had positive effect on students' achievement in reading and math, with students participating for multiple years realizing larger gains. Although the RAND study did not estimate the effects of specific providers, they did estimate the effects of a district

[6] Our study is distinct from Jones (2009) in that we employ alternative approaches to adjusting for student selection into SES at *multiple* stages (registration, attendance, level of attendance) and also selection into particular types of providers. In addition, the CPS studies primarily control for race and gender (although they also use gain scores to account for prior learning trajectories) and do not report results on student selection; we find other significant predictors of student selection into SES (e.g., student absences from school, prior SES attendance, English language learners and students with disabilities, etc.) that provide important information for school districts.

provider and reported mixed results. Socias et al. (2009) found that the district SES provider had no effect on student achievement in Anchorage and Hillsborough.

The Center for Research on Education Policy (CREP) conducted several, multi-year studies in Kentucky, Tennessee and Louisiana on provider-specific effects using a matched treatment-comparison strategy. Students attending SES were matched on observable characteristics to schoolmates who were eligible for SES but did not participate. They found mixed results for the overall effect of attending SES across different states. Specifically, Muñoz et al. (2008) analyzed student-level achievement for those who attended SES in Kentucky and found no significant effects for any individual provider, or for all providers combined. Similarly, Ross et al. (2008) found three providers were significantly worse than the comparison group in math (suggesting the potential for selection bias that is not adequately adjusted through matching), but no effects for any providers in reading for the 2007-08 school year in Tennessee. Finally, Potter et al. (2006) found most students in Louisiana who were served by SES providers did no better or worse than their counterparts who were not served.

The gap in knowledge that we aim to fill is to identify not only effective providers but also their attributes and approaches in delivering SES that contribute to their success. This should help policy makers better direct the resources that school districts are required to set aside for publicly funded tutoring. Although we realize that these results are based primarily on a single school district and have limited generalizability, CPS has one of the largest numbers of students eligible for and receiving SES, accounting for 10 percent of all SES recipients in the nation's public schools in 2008-09 (Center on Innovation and Improvement report, U.S. Department of Education). It is also one of a small number of school districts

identified as in need of improvement that successfully petitioned the federal government to directly provide SES. We more fully explore the implications of direct service provision by districts in the discussion of our findings and the concluding section.

Data and Methods

We obtained school record data for all students eligible for SES in CPS for the school years 2007-08, 2008-09, 2009-10 and 2010-11. The longitudinal database that we constructed includes student test scores, demographics, and information on their registration for and participation in the SES programs. These data allow us to construct measures of students' SES attendance with specific providers, including the number of hours of SES attended and total expenditures from provider invoices. The district also provided information on the SES providers, including whether they were online, off-site or on-site; district or non-district; for-profit or nonprofit, which allows us to explore the types of organizations and methods of service delivery that may contribute to improving student outcomes.

To construct the key outcome measures of student achievement gains (or changes) in student test scores, we use data from standardized tests (Illinois Standardized Achievement Tests (ISAT)). For each grade and year, we construct z-scores using the district mean and standard deviation, so that the test scores are comparable across grades and years. Table 1 shows the number of CPS students who are eligible, registered and attended SES for the different grades and years as well as the percentage of students with missing scores. Across the three panels and school years, the distribution of characteristics for those who are eligible, register for and attend SES look similar to the subset of those with gain scores. Therefore, the

missing data (other than grade 3)[7] will be treated as random.

Characteristics of Eligible Students and SES providers

Table 2 shows the characteristics of students who are eligible and registered for SES and who attended SES for the three school years for which we estimate SES effects. These measures, along with the student's grade year and school attended, serve as the core set of control variables intended to account for selection into SES in the estimation of SES effects. Our choice of these variables reflects specific criteria used by CPS in prioritizing eligible students for SES, as well as other characteristics we expect might be associated with the likelihood that eligible students will register for and attend SES. Per the law, the primary criterion for most school districts is free-lunch eligibility, but as the number of students eligible for SES has expanded, districts have specified additional criteria for registrations, such as grade level, past performance in school and student special needs. For example, in the 2009-10 school year, CPS established the following hierarchy of criteria for prioritizing registrations among eligible students: (1) free/reduced lunch-eligible; (2) all students in grades 1-3 and in high school, and English language learners (ELL) and students with disabilities (SWD) in grades 4-8, and then (3) students in grades 4-8 by reading stanine. The new emphasis on registering SWD and ELL students in 2009-10 is reflected in the larger percentage of SWD and ELL students that registered that year (vs. 2008-09), even though the percentage eligible were approximately the same from year to year. We also control for student absences in the prior school year, as we find, not surprisingly, that students who are

[7] Since the ISAT is taken in grades 3-8 in Illinois, we are not able to include students in grade 3, as there is no pre-test information for these students (with the exception of students who were retained in grade 3 in 2008-09). In the 2009-10 school year, 6% of students who registered and attended SES are missing (in grades 4 through 8) because they don't have test scores in the prior year (and our outcome measure is gains in achievement). The loss of data for 2008-09 school year is lower at 4%.

less likely to attend regular school are also significantly less likely to attend SES after school.[8] In addition, students who attended SES in a prior school year are significantly more likely to attend SES again.

If after controlling for the student characteristics shown in Table 2, other factors influencing participation in SES are random, then our estimates of the effects of SES should approximate the true effects. It is not possible to verify, however, that there are no unobserved, selective differences between eligible students who participate in SES and those who do not (and serve as comparison group members in our analysis). A well-executed random assignment experiment would be needed to assume statistical equivalence between students participating in SES and eligible nonparticipants. For example, if there was consistently greater demand for SES than funding, school districts might be persuaded to allocate opportunities to participate in SES by randomly assigning some fraction of the eligible students to receive services and others to a control group of students who would not be invited to participate. This would facilitate a causal analysis of the effects of SES on student outcomes. In the absence of random assignment, we can only estimate potential effects or associations that are suggestive of a possible causal interpretation of the findings, which we undertake employing rigorous econometric methods that adjust for selection.[9]

[8]Steinberg (2011) finds fewer prior-year disciplinary infractions among SES participants in CPS vs. those who did not participate in years 2006-07 and 2007-08. However, as we do not have access to CPS disciplinary data, this is an omitted factor in our analysis.

[9] We also explored the possibility of using a regression-discontinuity design for estimating SES effects in CPS, given that CPS identified explicit criteria for prioritizing students for SES when the number of eligible students exceeded available funding for services. However, after it was discovered in the 2009-10 school year that the monies paid out in the prior school year exceeded the funds budgeted for SES, registered students were denied services (i.e., told that they could not participate in SES) after being assigned to providers and showing up for sessions. As there was no systematic process followed in retracting the offer of services or tracking the students who were ultimately refused services, we determined that we could not achieve a clean approach to identification of effects through regression-discontinuity analyses.

Table 3 shows the characteristics of CPS students by SES provider type in the 2008-09, 2009-10 and 2010-11 school years. A few of the notable differences across provider types include a higher proportion of ELL students served by the district provider, a lower proportion of ELL students served by online providers, and a substantially larger proportion of students with disabilities receiving services from off-site providers. Students with disabilities were also significantly more likely to attend SES with online providers in 2009-10. These differences in student characteristics across different service provider types were also confirmed in the first stage propensity score matching model (discussed below) that predicted SES attendance with different provider types.[10]

Estimation Strategies

In our estimation of the average effects of SES and of attending SES with different types of providers on changes in student test scores, we adjust for student selection in registering for SES and/or their enrollment with particular types of providers (see again Table 3). In addition, we estimate individual, provider-specific effects for SES providers serving at least 30 students in a given school year (and conditional on having data for at least 30 students). SES providers serving fewer than 30 students are combined in a small-provider measure, allowing us to estimate the average effect of smaller providers relative to larger ones. We employ the following four strategies to address possible selection bias.

Value-added model. One way that education studies deal with selection is using value-added models. The formal value-added model we employ is specified in equation (1). The value-added strategy allows us to control for other classroom and school interventions

[10]Summary statistics on the characteristics of student served by specific (individual) SES providers are available upon request from the authors.

which are fixed over time, while identifying provider characteristics. For example, if there is a reading intervention at a school and those students also attend SES, failing to control for the intervention (school fixed effect) would bias the results. The outcome measure is the achievement gain made by a given student, which accounts for the possibility that students with similar characteristics might enter SES with different underlying achievement trajectories (as reflected in their prior test scores). We estimate the following equation,

$$A_{jst} - A_{jst-1} = \alpha SES_{jt} + \beta X_{jt-1} + \pi_s + \mu_{gt} + E_{jst} \qquad (1)$$

where A_{jst} is the achievement of student *j* attending school *s* in year *t*; SES*jt* is an indicator function if the student *j* attended SES in year *t*; X_{jt-1} are student characteristics which include student demographics, percent absent in prior year, retained in prior year, and attended SES in prior year; π_s is school fixed effect; μ_{gt} are grade by year fixed effects, and E_{jst} is the random error term. Identification in this specification comes from the average gain in student achievement after controlling for student characteristics and school and grade year effects.

Student fixed effects model. The value-added model assumes that selection depends on observed student characteristics. Hence, controlling for them allows us to deal with self-selection. However, if selection is on some unobserved or unmeasured characteristics of the students, then a value-added strategy could still lead to biased results. The student fixed-effects model controls for all time-invariant characteristics of a student, including those that are not observed or measured. The following model of an educational production differs from equation (1) in that it includes student fixed effects (δ_j) instead of school fixed effects,

$$A_{jst} = \alpha SES_{jt} + \beta X_{jt-1} + \delta_j + \mu_{gt} + E_{jst} . \qquad (2)$$

When we take the first difference of equation (2), we eliminate the student fixed effect (δ_j), and the model estimates the average difference between the gains made by students attending

SES with the gains made by similar students in CPS who were likewise eligible for SES. This formulation imposes some restrictions (or assumptions) that are important to note. First, the impact of students' prior experience does not deteriorate over time. This implies, for example, that the effect of the quality of kindergarten has the same impact on student achievement no matter the grade. The second assumption is that the unobserved effect of attending SES only affects the level but not the rate of growth in student achievement. A concern with this restriction is that if students with lower growth are more likely to choose to attend SES, then this type of selection may bias the estimates obtained from a gains model.

In order to relax this restriction, the following equation is estimated,

$$A_{jst} - A_{jst-1} = \alpha SES_{jt} + \beta X_{jt-1} + \delta_j + \mu_{gt} + E_{jst}. \qquad (3)$$

This approach to estimating the fixed effects model controls for any unobserved differences between students that are constant across time. The estimation of this model requires a first difference of equation (3) and therefore needs three or more observations for each student.[11] As students self-select into the SES program, we deal with this selection by using the gain scores made by same student in the prior year. Identification of the average impact of SES in this model comes from students who participate in one or more but not all years. If these students differ in systematic ways from all students who attend SES, then the estimator gives a ``local'' effect (specific to students with these characteristics) instead of an average effect. In estimating provider-specific effects, identification comes from students who transfer from one SES provider to another over the period of observation. Therefore, it is important that we check the robustness of the model results using alternative estimation strategies. Table C.1 in

[11] As SES providers serve students at multiple grade levels, it is reasonable to pool information across grade levels.

Appendix C shows the differences in characteristics between the students who are used for identification and those who are not in this estimation approach.

School and student fixed effects model. The base model for this estimation strategy is the combination of the two above methods. A school fixed effect (π_S) is added to equation (3), which gives:

$$A_{jst} - A_{jst-1} = \alpha SES_{jt} + \beta X_{jt-1} + \pi_s + \delta_j + \mu gt + E_{jst}. \qquad (4)$$

Adding a school fixed effect controls for unmeasured, time-invariant school quality. For example, in CPS, school administrators have a role in choosing the providers that deliver services on-site at their schools. If principals invite providers that they believe are best suited to their students and school environments, provider effects may be correlated with unobservable school characteristics that might affect student performance. The inclusion of school fixed effects facilitates controlling for time-invariant school characteristics such as average school test scores, neighborhood attributes, parental involvement in the school and peer composition, to the extent these are unchanging over time. The inclusion of student fixed effects effectively controls for student ability and other time-invariant student characteristics.

As discussed above, identification of the average impact of SES in this model comes from students who participate in some but not all years, or in the estimation of provider-specific effects, from students who transfer from one SES provider to another, whereas the identification of the school effect comes from students who switch schools. This model is generally preferred over the value added and the student fixed effects models, as it controls for both school and student fixed effects.[12] On the other hand, if the students who switch are

[12] We also check the results by restricting the analysis to those students who do not change schools and run the student fixed effects estimation using Equation (3), and we obtain similar results.

different across some time-variant, unobserved characteristics, the results from this strategy could still be biased.

Propensity score matching model. The focus of our analysis using matching methods is the estimation of the differential effects of different types of providers for students participating in SES. We employ propensity score matching (PSM), a two-step process in which the probability of participation in SES (with a particular type of provider) is first estimated based on student characteristics (X), generating predicted probabilities of participation (propensity scores). The matching process is thereby reduced to a one-dimensional problem of comparing students who receive SES from a particular type of provider with students with similar propensity scores who participate with other providers. In other words, if SES participants and comparison group members have the same propensity scores, the distribution of X across these groups will be the same:

$$Y_0 \perp D \mid X \Rightarrow Y_0 \perp D \mid P(X), \qquad (5)$$

and students can be compared on the basis of their propensity scores alone, where D is the treatment of attending SES with a given type of provider.

In applying PSM, we invoke the conditional independence assumption, which implies that after controlling for observable characteristics (X), a student's treatment status is unrelated to what his outcome would be in the counterfactual state (Rosenbaum and Rubin, 1983). The validity of this assumption depends largely on the set of variables or student characteristics (X) available for the estimation. There may be some unmeasured factors that influence participation with particular types of SES providers; what is important is that participation not be predictive of the outcome that would have occurred with another type of

provider. In addition, because our outcome variables are defined as the difference between a pre-program and post-program measure, we use a panel form of the matching estimator (difference-in-difference matching) that allows for time-invariant, unobserved differences between SES participants and comparison students without biasing estimates of program impacts. In estimating this model, we make the assumption that conditional independence holds for the periods both before (t) and after (t1) treatment:

$$E(Y_{0t1} - Y_{0t} | D_1 = 1, X) = E(Y_{0t1} - Y_{0t} | D_1 = 0, X) \quad (6)$$

This model estimates the average difference between the gains made by students attending SES with a specific type of provider with the gains made by ”matched” students attending with other providers, without putting a functional form on the gain equation (as in the case of student fixed effects). The control variables used in the first-stage matching model are the same as those included in the other modeling strategies (shown in Table 2). The primary PSM matching technique we apply in the second stage model is radius matching, which specifies a “caliper ” or maximum propensity score distance (0.01 in our analysis) by which a match can be made. It uses not only the nearest neighbor within each caliper, but all comparison cases within the caliper (based on the specified distance), and the common support condition is imposed to exclude poor matches from the analysis. It is important to reiterate that the sample used in this analysis only includes students who attended SES; thus, the estimates produced are relative comparisons between providers (or types of providers) that show their differential effects on student achievement.

After-matching balancing tests suggested that the matching generally worked effectively; for each of the different estimations (by year and provider type), the covariates were fully balanced after matching, with just two exceptions in 2009-10. In the estimation of

the effects of on-site providers for students attending SES in 2009-10, English language learners were less likely to attend SES with on-site providers (a small difference of 0.013 that was not reduced by matching), and in this same year, students with disabilities were significantly more likely to attend with off-site providers (a larger difference of 0.165 that was likewise not reduced by matching). There were no after-matching balancing concerns (statistically significant differences in covariate means) for 2008-09 or 2010-11.

Results of Analyses

Overall Effects of Attending SES

Tables 4 and 5 show the average effects of attending SES (using a dummy variable for any SES attendance) and the number of hours of SES attended, respectively. Irrespective of the variable or estimation strategy used, we find positive and statistically significant results of attending SES on math and reading achievement gains for CPS students. The effect size is very similar using the student fixed effects or school and student fixed effects strategies in reading and math. Table 4 shows that the effect size for reading is approximately 0.07-0.09 standard deviations, and for math, it is about 0.05-0.06. These effect sizes are about one-third of the average annual reading and math gains for elementary and middle school students (as reviewed by Hill et al., 2008).[13]

Table 5 reports the effects of the number of hours of SES received on student achievement in math and reading. We find that there is a positive and statistically significant effect of an additional hour of SES on student achievement. Appendix A shows histograms of

[13] Hill et al., 2008 find an average annual reading gain for 5th-6th graders of about 0.32 standard deviations and of 0.23-0.26 standard deviations for 6th-8th graders.

the number of hours of SES received by students who attended SES in these three school years (2008-09, 2009-10 and 2010-11). These histograms show distinct spikes in the distribution of SES hours attended, typically close to 40 and 60 hours of SES attended, reflecting, in part, that the number of hours attended is a function of the rate the providers charge and the maximum dollars allocated per student by CPS. For the average number of hours of SES received (approximately 40 hours), estimated effect sizes are comparable to those shown in Table 4. In Appendix B, we report findings on SES effects at the 40- and 60-hour attendance thresholds (using PSM methods) only for those students who attended SES (and for brevity, only for school year 2008-09). In general, these results are consistent with prior studies (Lauer et al., 2006), which suggest effect sizes are larger for programs offering 45 or more hours of tutoring.

In addition, we also estimated generalized propensity score models[14] using data on the total number of hours of SES students attended over the years 2008-2011 to assess the cumulative effects of tutoring on students' math and reading achievement (for those tutored). We are not able to attain balance across student characteristics at all intervals (e.g., quartiles or deciles) of hours of SES attended (likely due to unmeasured selection into different levels of SES attendance), and thus, we view these results as illustrative rather than causal. The graphical display of these results in Appendix B (Figures B.1 and B.2) suggests a linear relationship between hours tutored and reading gains through about 55 hours of tutoring, with diminishing returns to additional hours of SES setting in around 60 hours of tutoring.

[14] See Hirano and Imbens (2004) for more details on their extension of propensity score matching methods to cases where the treatment is continuous. In generalized propensity score matching, a "dose-response function" is estimated, where in this example, the "dose" is the number of hours a student is tutored, and the "response" is the impact that a given level of tutoring has on their reading and math gains.

Alternatively, the results for students' math achievement suggest a steady, positive relationship between hours tutored and math gains through 80-plus hours.

Heterogeneous Effects of SES Providers

A diverse range of providers come and go from the tutoring market. If there are identifiable attributes of the more effective providers and this information is made available to key stakeholders in SES (e.g., state and local educational agencies, students and parents), it could have the potential of increasing the effectiveness of SES (and tutoring services more generally) over time. We first discuss results that compare the CPS district provider with other (non-district) SES providers. Under federal regulations, school districts that have been identified for improvement are not eligible to provide SES, but CPS was one of a small number of districts granted waivers by the U.S. Department of Education to offer SES. Coming policy changes may allow an increasing number of school districts to engage in direct provision of SES, as well as other flexibility for innovative approaches to service provision.

There are several possible reasons we might expect to observe a different effect size for the district provider (A.I.M. High) compared to other SES providers. First, CPS uses only regular school-day teachers as tutors in its program, with the intent to provide continuity in learning from the regular school day to after-school instruction, as well as to take advantage of teacher knowledge about student needs. That said, if the instruction is less likely to be innovative or just more of the same from the school day, this feature might not benefit students. In addition, we know from our analysis of information on SES provider rates in CPS and other large urban districts that CPS not only charges a relatively low hourly rate as a district provider (approximately $28 per hour in 2009-10), but it also appears to have influenced rate-setting among other (non-district) providers in the Chicago area. We observe

the same non-district providers operating in other districts charging as much as twice the rate they charged for an hour of their services in CPS. Because the hourly rate charged directly affects the number of hours of SES students can receive before reaching the district maximum per-student allocation, CPS students are attending more hours of SES (compared to students in other districts). In this context, it is possible that a district provider could contribute to higher hours of SES tutoring received, and correspondingly, to greater program effectiveness.

The first analysis includes both SES-eligible students who attended and those who did not attend SES in the sample, so that the estimated effects are for district providers and other (non-district) providers relative to outcomes for eligible students who did not receive SES. (Alternatively, when we restrict our sample to include only students who attended SES, our estimated effects are differential effects between the district and other providers). The value-added (with school fixed effects), the student fixed effects and school with student fixed effects results (see Table 6) all show statistically significant effects of CPS district-provided services on students' math and reading achievement relative to students who do not receive SES. The coefficients are the changes (measured in standard deviations from district average reading and math test scores) in an average student's outcome that can be expected if the student participates in SES. The estimated coefficients are consistently larger for district vs. nondistrict providers, suggesting that attending SES with a district provider may generate a larger effect on student achievement than attending with a non-district provider. We explicitly test this in additional analyses discussed below and presented in Table 11. Although there are a few differences in estimated effect sizes (estimates from the fixed effects estimation approaches are slightly larger), they generally represent about one-third the average annual student gain scores.

Tables 7 and 8 present the provider-specific effect sizes for the district provider and other providers who have at least 30 students attending SES with them; smaller providers (serving less than 30 students) are grouped into a single "small provider" indicator. There is fairly strong agreement among the estimates of value-added and both types of fixed-effect models results, with a handful of providers standing out as particularly effective in both sets of results and/or across the three years (i.e., the district provider-A.I.M. High, Newton Learning, Orion's Mind, School Service Systems and SES of Illinois). With few exceptions, the provider-specific effect sizes from the school and student effects models are very close to those of the student fixed effects models.

In Appendix B, we report an average effect size of approximately 0.06 that was statistically significant for SES providers delivering 40 or more hours of tutoring to students. The CPS district provider was getting significantly more hours of SES to the students it served (an average of 48 hours, and nearly twice as many as other providers). Thus, it is not surprising that the effect size of the district provider is approximately twice the size of the average for all providers.[15] Effect sizes for Newton Learning, School Service Systems and SES of Illinois are similarly large. These providers have different hourly rates, although because we view the hourly rate and number of hours as part of the treatment (as defined or designed by a given provider), we do not include number of hours attended as a covariate.

Tables 9 and 10 report average effects of the district and other provider types on CPS students' reading and math achievement in 2008-09, 2009-10 and 2010-11, estimated using value-added models, student fixed effects models, and school and student fixed effects models. Table 11 shows the differential effects of different types of providers *for those*

[15] To test this hypothesis, we interacted the district indicator with the number of hours of SES the students received, and the difference between district and non-district provider disappeared.

students who attended SES using the three above mentioned estimation techniques and propensity score matching (respectively). Even though the samples differ to some extent (particularly for Table 11, where students attending with different types of providers are compared), the results are fairly consistent across specifications. On-site providers consistently have positive effects on student math and reading achievement (effect sizes of 0.042-0.081), and students attending SES with the district provider generally outperformed other *on-site* providers (although the difference between district and *nondistrict* providers is not statistically significant, as verified by an F-test, Prob > F = 0.152).[16] The results also suggest that online providers are generally less effective than other providers. The difference in the coefficients of online vs. on-site are statistically significant at 5% significance level. The sample size for *off-site* providers was relatively small in 2008-09 and 2009-10 (75 and 91, respectively), although more than 2,000 students attended SES with off-site providers in 2010-11. In 2009-10, off-site providers served a larger percentage of SWD students, and thus, we suggest interpreting these results with some caution.[17]

The effect sizes of attending SES with for-profit providers versus other nonprofit or district providers (see Table 10) suggest that for-profit providers are generally less effective than district/public providers in increasing student achievement, particularly for math. Students attending with for-profit providers gain about 0.03 standard deviations less than the district providers in reading and about 0.07 standard deviations less in math. Table 3 shows

[16] In each of the estimations reported, the standard errors of the coefficients are largest for the school and student fixed effects models.

[17] CPS prioritized students with disabilities in 2009-2010, with the result that even though the proportion of SWD among eligible students is the same in 2008-09 and 2009-10, the proportion attending SES is nearly double in 2009-10. We speculate that this compositional change in a small subsample might explain the differences in the magnitude of off-site effects (as seen in Table 9) across the school years.

that only about 2.5% of students attended SES with a nonprofit provider, and another 10-16% attended with the district provider; clearly, the largest share of students attend SES with for-profit providers.

The results in Table 11 show the estimated *differential* effects between the district and other providers, as well as the effects of other provider types, from the analysis that only includes students who attended SES. As the analysis is done for only those students who attend SES (controlling for their selection into specific provider types in the PSM analyses), a smaller sample size leads to larger standard errors than in the fixed effects strategies and fewer statistically significant results. The differential impacts can also be calculated from the previous tables, and the results are consistent across these different estimation strategies.

The first four rows of results in Table 11 present the average differential effect between the district provider and other SES providers serving CPS students in 2008-09, 2009-10 and 2010-11, estimated using value-added models, student fixed effects models, school and student fixed effects models, and propensity score matching (respectively). The results suggest that, on average, students attending SES with the district provider gain more on reading tests (approximately 0.02-0.04 standard deviations more where statistically significant) and more on math tests (approximately 0.02-0.06 standard deviations) than students attending with non-district providers. We also restricted the sample to only students who attended SES with an on-site provider, either the district or another on-site SES provider, to determine if the district provider performance differed from that of other on-site providers. These findings (in the fifth to eighth rows of results in Table 11) suggest that the district provider generally outperformed other on-site providers, with students who attended SES on-

site with the district provider realizing larger gains of 0.04-0.06 standard deviations more (where statistically significant) than other on-site providers.

Results of analyses comparing providers that deliver SES instruction online with other (off-line) providers (see Table 11) suggest that online providers are generally less effective than other providers, although the coefficients (differential effect sizes) are statistically significant only for the 2008-09 school year and in two specifications. The estimated (negative) differential effects for 2008-09 are highly comparable between the value-added and PSM models, suggesting students attending with online providers gain approximately 0.03-0.04 less than students attending SES with other providers. A final set of results comparing effect sizes of attending SES with for-profit providers versus other providers (nonprofit or public) again suggests that for-profit providers are generally less effective than non-profit and district/public providers in increasing student achievement, particularly for math.

Conclusion

Supplemental educational services (out-of-school tutoring) are a core provision of NCLB, in which school districts are mandated to pay for the cost of provision of after-school tutoring for low income and disadvantaged students who attend schools that are not making adequate yearly progress for three years. A key feature of this mandate is its reliance on the private sector to offer eligible students greater choice in a competitive market that is expected to encourage innovative service approaches and squeeze out ineffective providers. Identifying tutoring provider effects on student achievement is essential to generating the information necessary for students and parents to make informed choices of tutoring providers, but efforts to estimate provider effects are complicated by the fact that participation is voluntary. In this paper, we have drawn on nonexperimental methods to estimate the effects of SES providers

on student achievement in a large urban school district (Chicago Public Schools), which accounts for a significant share of students receiving tutoring under NCLB.

The findings of our empirical analyses of the effects of SES providers who served eligible CPS students in the 2008-09, 2009-10 and 2010-11 school years suggest that there is a statistically significant effect of attending SES on student achievement, particularly for those who receive at least 40 hours of tutoring. These effect sizes represent about one-third of the annual gains made by students in these schools, and the gains from tutoring generally increase with the number of hours of tutoring received.

Additionally, we find that the district provider is more effective than non-district and other on-site SES providers in increasing the math and reading test scores of students who attend SES, although we recognize that this effect may not generalize beyond CPS. In an ongoing qualitative component of our study that involves multiple, large urban school districts (Heinrich et al., 2012), we have identified several distinctive features of the implementation of SES in CPS that might explain the district's greater effectiveness, including the significantly lower hourly rate charged that allows more hours of tutoring for students, the use of regular school day teachers as tutors, and the use of school-based SES coordinators in monitoring and coordinating the delivery of tutoring services. Alternatively, we find that students receiving tutoring from online providers appear to gain less in reading and math than students attending with other providers. We are currently further documenting and analyzing the different types of digital/online providers (vs. non-digital providers), in an effort to identify empirically and qualitatively what contributes to these providers' lower average effectiveness, (e.g., do the online sessions involve interactions with a live tutor, or are they pre-loaded, self-directed

sessions?)[18] This is particularly important given that some urban school districts have seen substantial expansions of online providers' market shares of students attending SES.[19]

Students receiving tutoring from for-profit providers gain less than those attending with non-profit providers or the district provider, particularly in math. We also identified individual SES providers that were significantly more effective in producing math and reading gains for CPS students. These are a mix of for-profit and nonprofit SES providers, although each of them offers SES on-site (at the public schools that students attend).

Given that unmeasured differences in students who attend SES or attend with particular types of providers could still introduce bias in these results, we are encouraged by the fact that the findings are fairly consistent across the four different rigorous estimation methods that make different assumptions. We also note that our findings on provider-specific effects are consistent with the most recent CPS evaluation of SES as well (Jones, 2009), which identified many of the same providers as being among the most effective in CPS. Finally, we believe that our research has identified some basic characteristics of more effective approaches to the organization and management of SES programs that might be considered by other school districts seeking to improve tutoring outcomes, although we again caution that our findings should be viewed as associations (rather than causal effects).

By design, if NCLB or its successor initiatives (under recently granted waivers to states from NCLB provisions) are to achieve the broader goal of reducing the academic

[18] This has turned out to be a much larger undertaking than originally anticipated, because of the extent of variation among digital providers in practice and discrepancies in materials used by providers to advertise services or seek state approval for SES provision.

[19] In our ongoing, multisite study, we have observed online tutoring companies with a student "market share" as high as 88 percent in one urban school district, and a single digital provider delivering tutoring to more than 14,000 students in another large, urban school district.

achievement gap through after-school tutoring for students in under-performing schools, tutoring program administrators need adequate and independent (not self-reported) information on provider effectiveness to guide students' and parents' choices. We have presented readily adaptable estimation strategies that can be used by states and school districts to generate information on tutoring provider effectiveness for students and parents that will help them to make better informed choices. Whether under NCLB or waivers from its provisions, many school districts across the country will continue to spend millions of Title I funds on tutoring for economically and academically disadvantaged students, and these findings will help to inform those who are looking for guidance in improving these services and their impacts on student achievement.

Finally, the different levels of SES program administration—primarily district and state—could improve their coordination in oversight and monitoring of tutoring provider performance to more fully realize the potential of the competitive market in improving student outcomes. For example, with the evidence from this and related studies, states and districts might introduce performance-based contracts to exert more control over provider rates, minimum levels of tutoring delivered and other parameters of service delivery that this research suggests could contribute to improved outcomes. Indeed, under newly granted state waivers from NCLB provisions, some school districts are already establishing maximum hourly rates and/or other requirements that will ensure students are offered a minimum of 40 hours of tutoring (Heinrich et al., 2012). In this regard, we expect our study to more broadly speak to the viability of education and other policy interventions that employ a private market model to improve public sector outcomes.

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Table 1: Number of students eligible, registered for SES and who attended SES, with and without gain scores, for the 2008-09, 2009-10 and 2010-11 school years

Year 2008-09	District mean adjusted gain scores								
	All students			Students with gain scores			Students w/missing gain scores %		
	Eligible	Registered	AttendedSES	Eligible	Registered	AttendedSES	Eligible	Registered	AttendedSES
Grade	Freq.	Freq.	Freq.	Freq.	Freq.	Freq.	Freq.	Freq.	Freq.
3	13,363	7,252	6,530	1497	870	757	N/A	N/A	N/A
4	11,823	5,849	5,279	11,336	5,605	5,070	4%	4%	4%
5	11,581	5,308	4,755	11,149	5,126	4,602	4%	3%	3%
6	13,088	5,567	4,921	12,629	5,379	4,753	4%	3%	3%
7	12,695	4,441	3,818	12,263	4,292	3,697	3%	3%	3%
8	12,698	4,350	3,742	12,297	4,219	3,635	3%	3%	3%
Total	75,248	32,767	29,045	61,171	25,491	22,514	4%	4%	3%
Year 2009-10	District mean adjusted gain scores								
	All students			Students with gain scores			Students w/missing gain scores %		
	Eligible	Registered	AttendedSES	Eligible	Registered	AttendedSES	Eligible	Registered	AttendedSES
Grade	Freq.	Freq.	Freq.	Freq.	Freq.	Freq.	Freq.	Freq.	Freq.
3	16,739	8,030	7,652	N/A	N/A	N/A	N/A	N/A	N/A
4	14,380	3,052	2,839	13,142	2,876	2,684	9%	6%	5%
5	13,912	2,726	2,515	12,738	2,571	2,381	8%	6%	5%
6	14,182	2,687	2,448	13,078	2,536	2,314	8%	6%	5%
7	14,074	1,804	1,618	12,991	1,715	1,543	8%	5%	5%
8	14,255	1,737	1,532	13,178	1,626	1,435	8%	6%	6%
Total	87,542	20,036	18,604	65,127	11,324	10,357	8%	6%	5%
Year 2010-11	District mean adjusted gain scores								
	All students			Students with gain scores			Students with missing gain scores %		
	Eligible	Registered	AttendedSES	Eligible	Registered	AttendedSES	Eligible	Registered	AttendedSES
Grade	Freq.	Freq.	Freq.	Freq.	Freq.	Freq.	Freq.	Freq.	Freq.
3	18,607	7,537	4,748	1493	737	596	N/A	N/A	N/A
4	17,181	3,073	2,423	16,475	2,961	2,384	4%	4%	2%
5	17,256	2,523	1,994	16,541	2,453	1,965	4%	3%	1%
6	16,905	2,337	1,790	16,242	2,259	1,754	4%	3%	2%
7	15,780	1,437	1,062	14,992	1,352	1,015	5%	6%	4%
8	16,201	1,442	1,033	15,346	1,371	996	5%	5%	4%
Total	101,930	18,349	13,050	81,089	11,133	8,710	4%	4%	2%

Table 2: Student characteristics of those who are eligible, registered and attended SES

	All Eligible Students	Eligible students w/gain scores	All Registered Students	Registered students w/gain scores	All Attended Students	Attended students w/gain scores
	Year 08-09					
Student characteristics	75,248	61,171	34,838	25,492	30,306	22,515
Asian	1%	1%	1%	0%	1%	0%
Black	53%	54%	59%	61%	58%	59%
Hispanic	44%	44%	39%	38%	40%	39%
White	2%	2%	1%	1%	1%	1%
Other race	0%	0%	0%	0%	0%	0%
% Female	49%	49%	50%	50%	50%	50%
% ELL	12%	10%	14%	11%	15%	11%
% FRL	100%	100%	100%	100%	100%	100%
% Sp. Ed	14%	14%	15%	15%	15%	15%
Attended SES last year	26%	28%	38%	40%	39%	41%
% Absent last year	6%	5%	5%	5%	5%	5%
Retained this year	4%	2%	4%	1%	4%	1%
Read Gain (dist) zscore	0.00	0.00	0.03	0.03	0.03	0.03
Math Gain (dist) zscore	0.00	0.00	0.03	0.03	0.04	0.03
	All Eligible Students	Eligible students w/gain scores	All Registered Students	Registered students w/gain scores	All Attended Students	Attended students w/gain scores
	Year 09-10					
Student characteristics	87,542	65,414	20,036	11,393	18,604	10,424
Asian	2%	1%	1%	1%	1%	1%
Black	49%	48%	49%	49%	48%	49%
Hispanic	47%	48%	46%	47%	47%	47%
White	2%	2%	2%	2%	2%	2%
Other race	0%	0%	2%	1%	2%	1%
% Female	49%	49%	47%	45%	47%	45%
% ELL	12%	10%	20%	18%	20%	18%
% FRL	100%	100%	98%	98%	98%	98%
% Sp. Ed	13%	14%	22%	29%	22%	30%
Attended SES last year	42%	42%	58%	58%	59%	60%
% Absent last year	4%	4%	4%	4%	4%	4%
Retained this year	2%	1%	4%	1%	4%	1%
Read Gain (dist) zscore	-0.01	-0.01	0.05	0.05	0.06	0.06
Math Gain (dist) zscore	-0.02	-0.02	0.02	0.02	0.03	0.03
	All Eligible Students	Eligible students w/gain scores	All Registered Students	Registered students w/gain scores	All Attended Students	Attended students w/gain scores
	Year 10-11					
Student characteristics	101,930	81,089	18,349	11,133	13,050	8,710
Asian	2%	2%	1%	1%	1%	1%
Black	42%	43%	45%	47%	43%	44%
Hispanic	53%	52%	51%	49%	53%	52%
White	2%	2%	2%	2%	2%	2%
Other race	1%	1%	1%	1%	1%	1%
% Female	49%	49%	48%	48%	48%	47%
% ELL	16%	13%	26%	21%	26%	21%
% FRL	100%	100%	100%	100%	100%	100%
% Sp. Ed	12%	13%	16%	21%	18%	21%
Attended SES last year	8%	10%	9%	15%	11%	16%
% Absent last year	5%	5%	5%	5%	4%	4%
Retained this year	2%	3%	5%	8%	5%	8%
Read Gain (dist) zscore	0.01	0.01	0.09	0.09	0.10	0.10
Math Gain (dist) zscore	0.01	0.01	0.09	0.09	0.10	0.10

Table 3: Characteristics of Chicago Public Schools students served by different types of SES providers in the 2008-09, 2009-10 and 2010-11 school years

Provider Type	District	Non-district	Online	On-site	Off-site	For-profit	Nonprofit
Number of students, Year 2008-09	4037	21455	4166	19377	91	20770	626
Asian	0%	0%	1%	0%	0%	0%	0%
Black	53%	62%	70%	61%	66%	62%	63%
Hispanic	46%	36%	28%	37%	34%	36%	36%
White	1%	1%	1%	1%	0%	1%	1%
Other race	0%	0%	0%	0%	0%	0%	0%
% Female	50%	50%	51%	50%	49%	50%	54%
% English language learners	13%	11%	7%	11%	7%	11%	7%
% Free lunch eligible	100%	100%	100%	100%	100%	100%	100%
% Students w/disabilities	16%	15%	15%	15%	27%	15%	16%
Attended SES last year	41%	39%	40%	40%	42%	39%	38%
% Absent last year	5%	5%	5%	5%	5%	5%	5%
Retained this year	1%	1%	1%	2%	0%	1%	2%
Read Gain (dist) zscore	0.040	0.020	0.000	0.030	0.050	0.020	0.020
Math Gain (dist) zscore	0.060	0.020	0.000	0.030	0.000	0.020	0.050
Number of students, Year 2009-10	1182	10142	1105	9757	75	9886	255
Asian	0%	1%	2%	1%	25%	1%	0%
Black	48%	50%	53%	50%	41%	50%	57%
Hispanic	49%	46%	41%	46%	31%	46%	38%
White	1%	2%	2%	2%	3%	2%	1%
Other race	1%	1%	2%	1%	0%	1%	4%
% Female	44%	45%	43%	45%	37%	45%	39%
% English language learners	20%	17%	14%	17%	17%	17%	14%
% Free lunch eligible	98%	98%	98%	98%	100%	98%	96%
% Students w/disabilities	34%	29%	38%	28%	47%	29%	37%
Attended SES last year	42%	44%	46%	44%	33%	44%	43%
% Absent last year	4%	4%	4%	4%	4%	4%	5%
Retained this year	1%	1%	0%	1%	0%	1%	2%
Read Gain (dist) zscore	0.100	0.050	0.040	0.050	0.320	0.050	0.110
Math Gain (dist) zscore	0.070	0.020	0.000	0.020	-0.060	0.020	0.060
Number of students, Year 2010-11	1133	7331	1069	7114	1417	7262	69
Asian	1%	1%	1%	1%	1%	1%	0%
Black	39%	45%	80%	46%	38%	45%	52%
Hispanic	57%	51%	19%	51%	57%	51%	48%
White	2%	2%	0%	2%	3%	2%	0%
Other race	2%	1%	0%	1%	1%	1%	0%
% Female	46%	47%	48%	48%	44%	47%	54%
% English language learners	26%	20%	9%	21%	20%	20%	20%
% Free lunch eligible	100%	100%	100%	100%	100%	100%	100%
% Students w/disabilities	23%	23%	18%	22%	24%	23%	13%
Attended SES last year	14%	17%	18%	17%	15%	17%	20%
% Absent last year	4%	4%	5%	4%	4%	4%	4%
Retained this year	9%	8%	11%	8%	8%	8%	12%
Read Gain (dist) zscore	0.148	0.091	0.073	0.095	0.115	0.091	0.085
Math Gain (dist) zscore	0.140	0.086	0.074	0.100	0.072	0.087	0.012

Table 4: The average effect of attending SES (under alternative estimation strategies)

	Reading									
	Value Added Model (with School Fixed Effects)						Student Fixed Effects Model		School and Student Fixed Effects Model	
	Year 2008-09		Year 2009-2010		Year 2010-11					
	Coef	SE	Coef	SE	Coef	SE	Coef	SE	Coef	SE
Attended SES	0.043	0.006	0.094	0.009	0.075	0.009	0.078	0.013	0.078	0.013
No. of observations	61171		63506		80510		205187		205187	
No. of schools	227		454		302		466		466	
No. of students	61171		63506		80510		119970		119970	
	Math									
	Value Added Model (with School Fixed Effects)						Student Fixed Effects Model		School and Student Fixed Effects Model	
	Year 2008-09		Year 2008-09		Year 2010-11					
	Coef	SE	Year 2009-2010		Coef	SE	Coef	SE	Coef	SE
Attended SES	0.046	0.005	0.053	0.008	0.064	0.009	0.057	0.012	0.057	0.012
No. of observations	61464		63773		80614		204094		204094	
No. of schools	227		455		302		466		466	
No. of students	61464		63773		80614		119441		119441	

Table 5: Average effects of the number of hours of SES attended on student achievement in math and reading

Hours of SES Attended	Reading									
	Value Added Model (with School Fixed Effects)						Student Fixed Effects Model		School and Student Fixed Effects Model	
	Year 2008-09		Year 2009-2010		Year 2010-11					
	Coef	SE	Coef	SE	Coef	SE	Coef	SE	Coef	SE
Attended SES	0.0011	0.00013	0.0026	0.0002	0.0016	0.0002	0.0020	0.0003	0.0028	0.0005
No. of observations	61171		63506		80510		205187		205187	
No. of schools	227		454		302		466		466	
No. of students	61171		63506		80510		119970		119970	
	Math									
Hours of SES Attended	Value Added Model (with School Fixed Effects)						Student Fixed Effects Model		School and Student Fixed Effects Model	
	Year 2008-09		Year 2009-2010		Year 2010-11					
	Coef	SE	Coef	SE	Coef	SE	Coef	SE	Coef	SE
Attended SES	0.0013	0.0001	0.0013	0.0002	0.0015	0.0002	0.0016	0.0003	0.0012	0.0005
No. of observations	61464		63773		80614		204094		204094	
No. of schools	227		455		302		466		466	
No. of students	61464		63773		80614		119441		119441	

Table 6: The average effects of attending SES with district provider vs. a non-district provider

	Reading									
	Value Added Model (with School Fixed Effects)						Student Fixed Effects Model		School and Student Fixed Effects Model	
	Year 2008-09		Year 2009-2010		Year 2010-2011					
	Coef	SE	Coef	SE	Coef	SE	Coef	SE	Coef	SE
District	0.045	0.013	0.128	0.019	0.091	0.020	0.111	0.027	0.106	0.026
Nondistrict	0.042	0.006	0.088	0.009	0.072	0.010	0.073	0.014	0.074	0.014
No. of observations	61171		63506		80510		205187		205187	
No. of schools	227		454		302		466		466	
No. of students	61171		63506		80510		119970		119970	
	Math									
	Value Added Model (with School Fixed Effects)						Student Fixed Effects Model		School and Student Fixed Effects Model	
	Year 2008-09		Year 2009-2010		Year 2010-2011					
	Coef	SE	Coef	SE	Coef	SE	Coef	SE	Coef	SE
District	0.067	0.011	0.065	0.020	0.092	0.022	0.123	0.032	0.115	0.031
Nondistrict	0.037	0.005	0.047	0.008	0.059	0.009	0.048	0.013	0.048	0.013
No. of observations	61464		63773		80614		204094		204094	
No. of schools	227		455		302		466		466	
No. of students	61464		63773		80614		119441		119441	

Table 7: Effects of attending SES with the district provider and other providers on reading gains

	Value Added Model (with School Fixed Effects)						Student Fixed Effects Model		School and Student Fixed Effects Model	
	Year 2008-09		Year 2009-2010		Year 2010-2011					
Reading Gain	Coef	SE	Coef	SE	Coef	SE	Coef	SE	Coef	SE
District	0.045	0.013	0.129	0.019	0.091	0.020	0.110	0.027	0.105	0.026
Small Providers	0.033	0.038	0.174	0.048	0.082	0.075	0.120	0.060	0.119	0.060
A+ Tutoring Service, LTD	0.095	0.044					0.153	0.098	0.147	0.101
Academic Advantage					0.107	0.045	-0.047	0.134	-0.045	0.137
ASPIRA	0.009	0.006					-0.029	0.069	-0.024	0.067
Babbage Net School	0.043	0.034	0.081	0.082	-0.020	0.073	0.025	0.055	0.037	0.056
Black Star Project	0.089	0.069	0.051	0.122			0.018	0.136	0.035	0.135
Brain Hurricane	0.080	0.024	0.040	0.022	0.107	0.025	0.101	0.055	0.090	0.053
Brainfuse One-to-One	-0.005	0.031	0.044	0.060	0.256	0.075	0.007	0.069	0.012	0.070
Brilliance Academy	0.061	0.047			0.009	0.030	0.054	0.072	0.067	0.070
Cambridge Educational	0.050	0.028	0.094	0.041	0.016	0.032	0.032	0.056	0.023	0.057
Chess Academy	0.034	0.029	-0.030	0.026	0.114	0.040	0.063	0.040	0.059	0.041
Children's Home+Aid Soc.	0.007	0.020	0.044	0.099	0.038	0.113	0.025	0.097	0.035	0.099
ClubZ! Tutoring Service	0.048	0.047	0.126	0.083	0.026	0.046	0.060	0.077	0.057	0.078
CSC Julex Learning	0.051	0.051								
Educate Online	0.022	0.016	0.194	0.049			0.055	0.048	0.055	0.048
Failure Free Reading	-0.029	0.062								
Huntington - ONSITE	0.049	0.020	0.035	0.047	0.127	0.038	0.073	0.055	0.074	0.055
IEP (ONSITE)	0.102	0.037	0.013	0.059	0.031	0.085	0.097	0.112	0.096	0.113
Imagine Learning					-0.066	0.080				
Learn it Systems					0.232	0.085				
Literacy for All	-0.004	0.033	0.082	0.038	0.052	0.076	0.115	0.058	0.112	0.058
Mainstream Development	0.057	0.059	0.033	0.069			0.026	0.111	0.037	0.112
NESI	0.000	0.063			0.017	0.071	0.046	0.053	0.027	0.040
Newton Learning	0.053	0.013	0.115	0.019	0.069	0.022	0.126	0.028	0.124	0.027
One to One	0.164	0.068								
Orion's Mind	0.044	0.011	0.069	0.015	0.094	0.023	0.072	0.024	0.074	0.025
Platform Learning	-0.012	0.024					-0.023	0.058	-0.013	0.061
Poder Ser (ONSITE)	0.093	0.035	0.113	0.088			0.059	0.136	0.080	0.134
Princeton Review	0.038	0.017					0.024	0.054	0.034	0.054
Progressive Learning	0.045	0.018	0.082	0.030	-0.022	0.034	0.027	0.034	0.029	0.034
Rocket Learning Partners	0.025	0.029	0.058	0.033	-0.025	0.038	0.029	0.049	0.035	0.050
School Service Systems	0.059	0.018	0.130	0.032	0.074	0.033	0.111	0.046	0.109	0.047
SES of Illinois	0.044	0.025	0.128	0.019	0.056	0.023	0.095	0.034	0.098	0.036
SPC Educational Services					-0.053	0.048				
Smart Kids, Inc					0.216	0.188				
Spanish Learning Center					0.135	0.064				
Sylvan Learning					0.168	0.081				
The Homework Master Center					0.222	0.086				
Tutorial Services	0.036	0.042					-0.038	0.181	-0.042	0.184
Unparalleled Solutions	0.065	0.045	0.102	0.037	0.061	0.048	0.050	0.081	0.058	0.084
No. of observations	61171		63506		80510		205187		205187	
No. of schools	227		454		302		466		466	
No. of students	61171		63506		80510		119970		119970	

Table 8: Effects of attending SES with the district provider and other providers on math gains

	Value Added Model (with School Fixed Effects)					
	Year 2008-09		Year 2009-2010		Year 2010-2011	
Math Gain	Coef	SE	Coef	SE	Coef	SE
District	0.065	0.011	0.066	0.020	0.092	0.022
Small Providers	0.032	0.036	0.000	0.044	0.080	0.099
A+ Tutoring Service, LTD	0.021	0.058				
Academic Advantage					0.166	0.040
ASPIRA	0.022	0.097				
Babbage Net School	0.063	0.028	-0.032	0.025	-0.005	0.083
Black Star Project	0.049	0.054	0.128	0.111		
Brain Hurricane	0.071	0.025	0.061	0.033	0.039	0.027
Brainfuse One-to-One	-0.022	0.022	-0.032	0.071	0.000	0.051
Brilliance Academy	0.000	0.058			0.002	0.044
Cambridge Educational	0.090	0.031	0.051	0.035	0.063	0.031
Chess Academy	0.066	0.039	0.065	0.025	0.102	0.046
Children's Home+Aid Soc.	0.173	0.021	0.086	0.037	0.024	0.146
ClubZ! Tutoring Service	-0.017	0.039	0.047	0.071	0.083	0.015
CSC Julex Learning	-0.029	0.060				
Educate Online	0.022	0.013	0.041	0.044		
Failure Free Reading	0.027	0.044				
Huntington - ONSITE	0.016	0.016	0.037	0.036	0.035	0.029
IEP (ONSITE)	0.037	0.049	0.020	0.038	0.132	0.093
Imagine Learning					0.051	0.067
Learn it Systems					0.029	0.089
Literacy for All	-0.003	0.035	0.092	0.031	0.037	0.043
Mainstream Development	-0.012	0.040	0.033	0.044		
NESI	0.071	0.038			0.118	0.024
Newton Learning	0.061	0.016	0.031	0.017	0.071	0.023
One to One	0.157	0.083				
Orion's Mind	0.050	0.010	0.037	0.013	0.081	0.017
Platform Learning	-0.018	0.031				
Poder Ser (ONSITE)	0.007	0.072	-0.010	0.034		
Princeton Review	0.050	0.017				
Progressive Learning	0.008	0.017	0.046	0.023	-0.005	0.037
Rocket Learning Partners	0.005	0.024	-0.013	0.034	-0.021	0.044
School Service Systems	0.012	0.023	0.106	0.022	0.051	0.037
SES of Illinois	0.046	0.026	0.086	0.023	0.053	0.021
SPC Educational Services					-0.015	0.091
Smart Kids, Inc					-0.132	0.013
Spanish Learning Center					0.079	0.031
Sylvan Learning					0.158	0.107
The Homework Master Center					0.012	0.105
Tutorial Services	-0.005	0.047				
Unparalleled Solutions	0.072	0.032	0.026	0.041	0.096	0.046
No. of observations	61464		63773		80614	
No. of schools	227		455		302	
No. of students	61464		63773		80614	

Table 9: Effects of attending SES with the district, online, on-site and off-site providers

Reading	Value Added Model (with School Fixed Effects)						Student Fixed Effects Model		School and Student Fixed	
	Year 2008-09		Year 2009-2010		Year 2010-2011					
Provider type	Coef	SE	Coef	SE	Coef	SE	Coef	SE	Coef	SE
District	0.044	0.013	0.128	0.019	0.091	0.020	0.102	0.024	0.096	0.024
Online	0.007	0.011	0.033	0.024	-0.009	0.025	0.001	0.023	0.001	0.023
Onsite	0.042	0.006	0.081	0.009	0.066	0.011	0.069	0.015	0.070	0.015
Offsite	0.082	0.073	0.350	0.077	0.089	0.020	0.134	0.050	0.135	0.051
No. of obs.	61171		63506		80510		205187		205187	
No. of schools	227		454		302		466		466	
No. of students	61171		63506		80510		119970		119970	
Math	Value Added Model (with School Fixed Effects)						Student Fixed Effects Model		School and Student Fixed	
	Year 2008-09		Year 2009-2010		Year 2010-2011					
Provider type	Coef	SE	Coef	SE	Coef	SE	Coef	SE	Coef	SE
District	0.064	0.011	0.065	0.020	0.092	0.022	0.106	0.028	0.098	0.028
Online	-0.010	0.010	-0.001	0.018	-0.027	0.025	-0.023	0.023	-0.023	0.023
Onsite	0.038	0.005	0.049	0.008	0.064	0.010	0.050	0.013	0.050	0.013
Offsite	-0.001	0.059	-0.064	0.053	0.056	0.020	0.025	0.057	0.031	0.058
No. of obs.	61464		63773		80614		204094		204094	
No. of schools	227		455		302		466		466	
No. of students	61464		63773		80614		119441		119441	

Table 10: Effects of attending SES with the district, for-profit and not-for-profit providers

Reading	Value Added Model (with School Fixed Effects)						Student Fixed Effects Model		School and Student Fixed	
	Year 2008-09		Year 2009-2010		Year 2010-2011					
Provider type	Coef	SE	Coef	SE	Coef	SE	Coef	SE	Coef	SE
District	0.045	0.013	0.129	0.019	0.091	0.020	0.151	0.034	0.142	0.034
For-profit	0.042	0.006	0.089	0.009	0.071	0.010	0.120	0.028	0.117	0.029
Not-for-profit	0.054	0.025	0.099	0.061	0.030	0.059	0.056	0.030	0.053	0.030
No. of obs.	61171		63506		80510		205187		205187	
No. of schools	227		454		302		466		466	
No. of students	61171		63506		80510		119970		119970	
Math	Value Added Model (with School Fixed Effects)						Student Fixed Effects Model		School and Student Fixed	
	Year 2008-09		Year 2009-2010		Year 2010-2011					
Provider type	Coef	SE	Coef	SE	Coef	SE	Coef	SE	Coef	SE
District	0.067	0.011	0.065	0.020	0.092	0.022	0.162	0.035	0.151	0.035
For-profit	0.037	0.005	0.048	0.008	0.058	0.009	0.099	0.025	0.096	0.026
Not-for-profit	0.063	0.031	0.036	0.036	-0.071	0.068	0.066	0.027	0.063	0.027
No. of obs.	61464		63773		80614		204094		204094	
No. of schools	227		455		302		466		466	
No. of students	61464		63773		80614		119441		119441	

Table 11: Differences in SES effects by provider types (for students who attended SES)

	Reading						Math					
	Year 2008-09		Year 2009-10		Year 2010-11		Year 2008-09		Year 2009-10		Year 2010-11	
	Coef	SE	Coef	SE	Coef	SE	Coef	SE	Coef	SE	Coef	SE
District vs. Non-district												
Value Added	0.020	0.018	0.027	0.030	0.040	0.035	0.039	0.017	-0.003	0.027	0.024	0.027
Student FE	0.033	0.089	Results are for all 3 years				0.063	0.099	Results are for all 3 years			
School&Student FE	0.008	0.094					0.062	0.102				
PSM	0.029	0.012	0.065	0.020	0.042	0.020	0.041	0.011	0.049	0.018	0.048	0.018
District vs. other onsite providers												
Value Added	0.016	0.019	0.032	0.032	0.060	0.037	0.040	0.018	-0.014	0.026	0.026	0.033
Student FE	0.025	0.082	Results are for all 3 years				0.070	0.101	Results are for all 3 years			
School&Student FE	0.005	0.089					0.065	0.106				
PSM	0.016	0.011	0.059	0.019	0.041	0.019	0.033	0.010	0.043	0.017	0.046	0.021
Online vs. Not online												
Value Added	-0.028	0.013	0.025	0.029	-0.014	0.034	-0.042	0.012	-0.005	0.020	-0.021	0.033
Student FE	-0.087	0.089	Results are for all 3 years				-0.047	0.081	Results are for all 3 years			
School&Student FE	-0.087	0.095					-0.049	0.086				
PSM	-0.027	0.011	-0.009	0.022	0.012	0.022	-0.038	0.010	-0.024	0.019	-0.040	0.021
For-profit vs Non-profit												
Value Added	-0.022	0.015	-0.028	0.032	-0.036	0.032	-0.041	0.016	0.016	0.022	-0.007	0.025
Student FE	-0.022	0.089	Results are for all 3 years				-0.053	0.090	Results are for all 3 years			
School&Student FE	0.006	0.093					-0.048	0.093				
PSM	-0.009	0.011	-0.067	0.020	-0.046	0.020	-0.024	0.011	-0.055	0.017	-0.038	0.018

Appendix A

Figure 1: Hours of SES received by students attending SES in 2008-09 school year

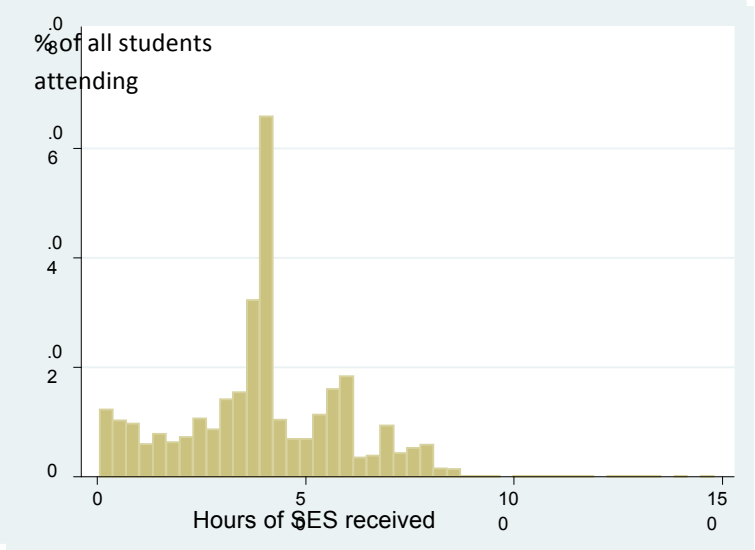


Figure 2: Hours of SES received by students attending SES in 2009-10 school year

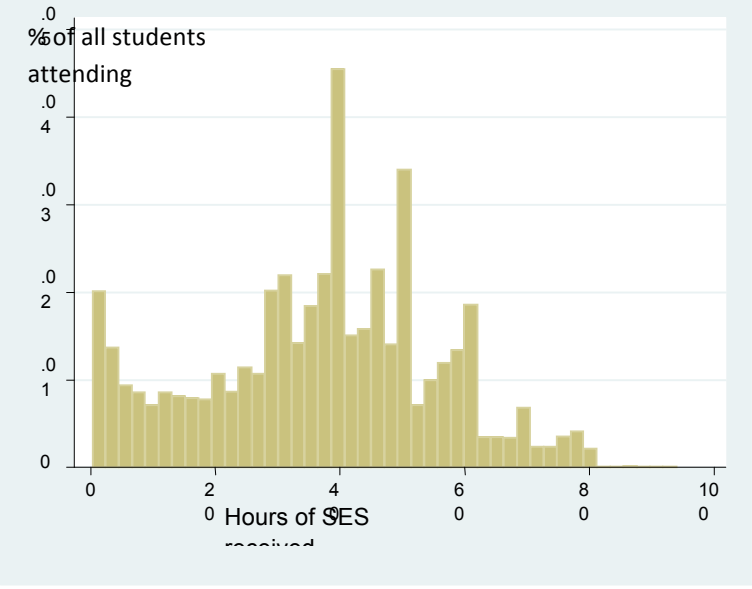
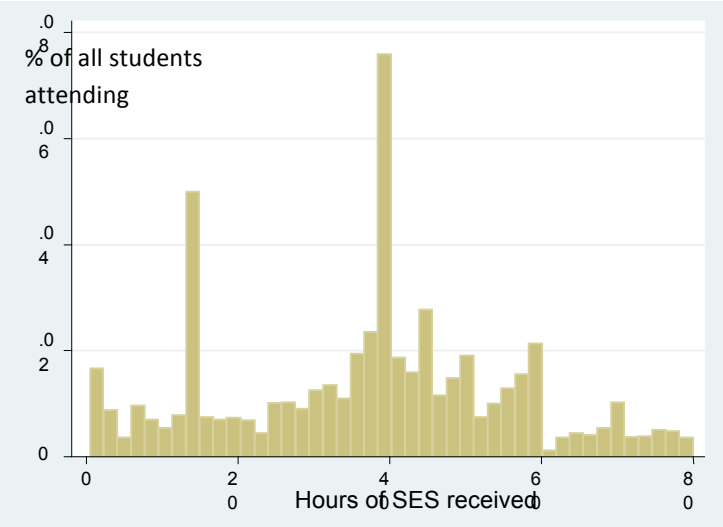


Figure 3: Hours of SES received by students attending SES in 2010-11 school year



Appendix B: Analyses of SES Effects for Students Who Attended Some SES

Table B.1 below reports the estimated effects of SES (measured as changes in students math and reading scores) at common peaks of SES attended (40 and 60 hours) for elementary and middle school students. We compare only students who attended in the 2008-09 school year, separately matching students with attendance levels above and below each of these points and controlling for their probability of registering for and attending SES and other characteristics.

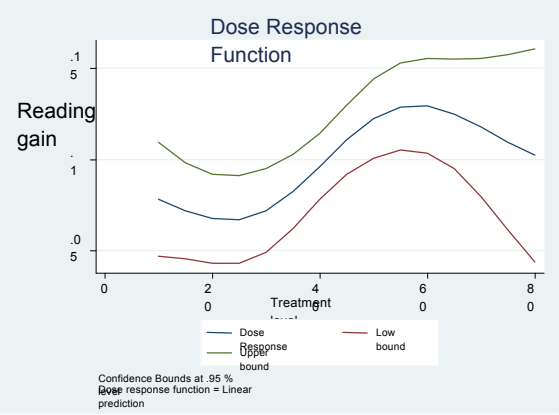
For elementary school students (first column of results), we find comparably sized effects for both math and reading of approximately 0.06 standard deviations (range: 0.054 - 0.68). In comparison, these effect sizes are about one-fifth the size of the average annual reading and math gains in elementary students (Hill et al., 2008). For middle school students, the estimated effect sizes are statistically significant only in the case of math (0.053-0.067). As average annual math gains trend downwards as grade level increases (Hill et al., 2008), these effects are substantively greater than for elementary students (about one-fourth of the average annual gains in math).

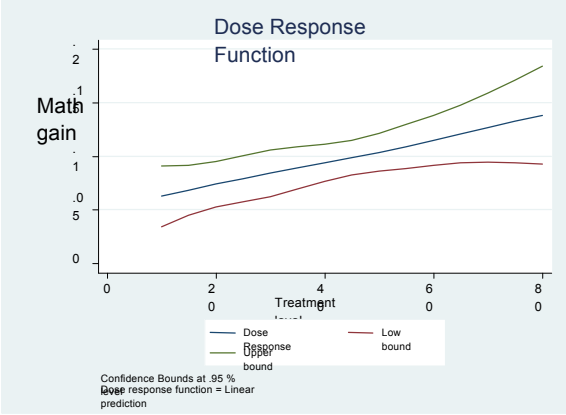
Table B.1: The average effect of attending SES from propensity score matching analysis

Year 2008-09	Reading		Math	
	Grades 3-5	Grades 6-8	Grades 3-5	Grades 6-8
	Coefficient	Coefficient	Coefficient	Coefficient
Attend 40 or more hours of SES vs <40 hours	0.068**	0.018	0.054**	0.067**
Attend 60 or more hours of SES vs <60 hours	0.058**	0.022	0.057**	0.053**

**Statistically significant at 0.5%

Figures B.1 and B.2: Generalized propensity score estimates of cumulative SES effects on student reading and math achievement





Appendix C

Table C.1: Number of students who either changed status or changed SES providers

Changed SES status	Changed providers		
	0	1	Total
0	54,425	4,852	59,277
1	0	24,494	24,494
Total	54,425	29,346	83,771

Note: "Changed SES status" is a dummy variable that takes the value 1 if the student attended SES last year but not this year (and vice-versa). "Changed providers" is a dummy variable that indicates if the student changed providers.

Table C.2: Summary of students who either changed status or changed SES providers

	Changed SES status		Changed Providers	
	No	Yes	No	Yes
# of obs	59,277	24,494	54425	29,346
black	46%	53%	46%	53%
Hispanic	50%	45%	51%	45%
Female	49%	49%	50%	48%
English language learner status	7%	11%	6%	12%
Free lunch status	100%	100%	100%	100%
Students w/disabilities status	12%	18%	10%	20%
% Absent last year	5%	4%	5%	4%
Retained last year	1%	2%	1%	2%

Note: "Changed SES status" is a dummy variable that takes a value of 1 if the student attended SES last year but not this year (and vice-versa). "Changed providers" is a dummy variable that indicates if the student changed providers.