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# Educational Choice and Student Participation: The Case of the Supplemental Educational Services Provision in Chicago Public Schools

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*The Supplemental Educational Services (SES) provision of the No Child Left Behind Act offers free tutoring services to students attending perennially underperforming schools. The author assesses the extent to which Chicago Public Schools students most in need of and who could potentially benefit the most from additional academic instruction participate in SES. The author uses multilevel cohort and longitudinal analyses to explore the characteristics of students participating in SES in Chicago Public Schools from 2004–2005 to 2007–2008. The results of this study, among the first empirical evaluations of SES participation, suggest that students with higher observed cognitive achievement are less likely to engage the SES provision, whereas students with better noncognitive performance are more likely to participate in SES.*

Keywords: *educational policy, educational choice, No Child Left Behind, Supplemental Educational Services*

EDUCATIONAL reform in the United States has increasingly focused on providing additional educational choices for families and students. Over the past 20 years, the introduction of charter schools, along with policies promoting voucher initiatives and tax credit–funded scholarships, has expanded the schooling options available to families, particularly those whose children attend schools in urban communities and for whom the school choice decision is largely constrained by disadvantaged economic circumstances. Although little consensus exists concerning the demand-side factors (e.g., student and family characteristics) motivating participation in these educational choice options (Belfield, 2004; Bosetti, 2004; Campbell, West, & Peterson; 2005; Chakrabarti, 2005; Goldhaber, 1996; Howell, 2004; Lankford & Wyckoff, 1992; Levin; 1998; Manski, 1992; Neal, 1997; Witte & Thorn, 1996), it is clear that families are taking advantage of educational choice options when available. Indeed, the share of U.S. public school students attending charter schools has increased more than threefold over the past decade,[1] while approximately 35,000 general education students nationwide receive publicly funded vouchers, and more than 100,000 students (across six states) attend private schools via tax credit–funded scholarship donations made by corporations and individuals to scholarship-granting organizations (Steinberg, 2010).

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Under the federal No Child Left Behind (NCLB) legislation, the expansion of educational choice has taken a new form. In particular, the Supplemental Educational Services (SES) provision, a core accountability provision of NCLB, mandates that perennially underperforming Title I schools—those that fail to meet adequate yearly progress (AYP) benchmarks for 3 consecutive years—offer free academic tutoring to eligible students.[2] The U.S. Department of Education (2009b) defines SES as "additional academic instruction designed to increase the academic achievement of students in schools in the second year of improvement, corrective action, or restructuring" and stipulates that these services must be offered outside the regular school day and "in addition to instruction provided during the school day" (p. 1).

The introduction of the SES provision presents a unique opportunity to assess the extent to which students participate in a new form of educational choice, one that deals explicitly with additional academic services rather than school choice. Although the stated goal of the SES policy is to increase the academic achievement of eligible students, an assumption underlying this goal is that eligible students most in need of additional academic instruction and for whom these services will generate the greatest benefit will access SES. Indeed, the policy requires that if funds are insufficient to provide SES to all eligible students, priority must be given to the lowest achieving eligible students.[3]

Absent a clear understanding of the factors related to participation in SES, however, researchers and policy makers are unable to adequately evaluate whether the resources dedicated to this policy are reaching those students who would most benefit from them. An assessment of the effectiveness of SES therefore relies heavily on the characteristics of students who engage in the services that the policy offers. In particular, the SES policy may be deemed an efficient use of educational resources if it redirects resources to students who need them the most (i.e., students who are reading below grade level) and to students with the potential to use them most effectively (i.e., students who are more motivated to participate in additional academic instruction).

To better understand educational choice in this new context, I explore in this article the demand-side response to the availability of free tutoring services offered through the SES provision. My aim is to shed light on the use of SES by identifying the characteristics of students who choose to participate in SES in Chicago. I also provide evidence to inform the important question of whether students who most need additional academic services (and who can potentially derive the most benefits from them) are receiving SES. I address three questions of interest: Are higher (or lower) achieving students more likely to participate in SES? To what extent do students who are more (or less) motivated and engaged in school receive additional academic instruction through SES? To what extent does SES participation vary within and across eligible students as well as across schools in Chicago?

Although not specifically addressing the impact of SES on student achievement,[4] the extent to which SES has the capacity to affect student achievement relies on the nature of student participation. In light of a recent report on the underuse of SES nationally (Gill et al., 2008), in this article I provide among the first empirical evidence on the demand-side characteristics associated with participation in SES.[5] In doing so, this work contributes to the existing literature on educational choice by providing greater transparency around the characteristics of SES-eligible students in Chicago participating in SES. I also aim to inform the pending reauthorization of NCLB by characterizing both the extent to which SES-eligible students in a large urban school district are participating in the federally funded tutoring provision under SES and the factors contributing to the decision to participate in new forms of educational choice options.

## The Dynamics of SES Participation

The schooling and educational decisions that families[6] make are influenced by a number of factors. The literature on the ecology of schooling suggests that the characteristics of micro-domains such as the home, school, and community contexts, as well as the influence of peers, shape educational schooling decisions as well as youth academic and social outcomes (Brooks-Gunn, Duncan, Klebanov, & Sealand, 1993; Epstein & Sanders, 2000). As such, consideration of demand- and supply-side conditions is critical to understanding the dynamics shaping SES participation.

On the demand side, any low-income student is eligible for SES if he or she is enrolled in a Title I school that has not made AYP for 3 years or more.[7] As the text of the SES provision explains, "eligibility is not dependent on whether a student is a member of a subgroup that did not make AYP or whether a student is in a grade that takes the statewide assessments" (U.S. Department of Education, 2009b, p. 2). In addition to the characteristics of eligible students, school composition—a student's peers and teachers—may also influence the decision to participate in additional academic instruction. In SES-eligible schools facing increasing sanctions associated with underperformance, teachers (and school administrators) may target students performing just below academic proficiency benchmarks for additional academic instruction through SES. Evidence from Chicago suggests that accountability policies such as NCLB (which determine school-level performance on the basis of the share of students meeting or exceeding proficiency levels on standardized exams) provide incentives for teachers and principals to target students near (e.g., just below) the proficiency threshold for extra academic attention. Moreover, evidence from Chicago also finds that the least academically advantaged students did not realize test score gains after the introduction of NCLB, suggesting that teachers and school administrators strategically targeted students for whom additional teacher effort would generate the greatest schoolwide benefit in terms of proficiency rates rather than benefit students most in need of additional academic support (Neal & Schanzenbach, 2010).

Funding and informational constraints on the demand side shape the availability of and preferences for SES. At the district level, SES is funded by existing Title I dollars, representing a net decrease in money available to school districts. As a result, districts have a financial incentive to discourage student participation in SES (Peterson, 2005). Family preferences for SES are shaped by the extent of asymmetric information; that is, decisions made about additional academic instruction for their children are done so in the context of very incomplete information about the type and nature of services that SES providers offer and their track record of effectively raising student achievement (Steinberg, 2006). Indeed, parents of SES-eligible students in Milwaukee expressed concern over the availability of information about SES providers, including programmatic features such as the amount of one-on-one tutoring their children would receive, the student-teacher ratio during group sessions, and specific information about tutor qualifications and the academic content of an SES provider's program (Heinrich, Meyer, & Whitten, 2010).

Competing after-school commitments also shape demand for SES. On one hand, students who participate on sports teams, are responsible for child care (e.g., babysitting younger siblings), or have after-school employment may undervalue SES, lowering the likelihood of participation. On the other hand, parents whose work schedules prohibit them from picking students up after school may value SES as a form of free after-school care and increase the relative value of SES participation. Therefore, transportation and logistical costs play an important role in how families value SES and, in turn, influence the likelihood of SES participation.

Supply-side factors also influence participation in SES.[8] Variation in SES provider availability and differential access to tutoring programs within and across neighborhoods may contribute to student- and school-level differences in SES participation. For example, SES providers that offer online content may not be available to families without either home computers or Internet connections. Limited space in schools to accommodate providers reduces the menu of options available to families. SES options may differ dramatically across schools on the basis of factors such as school size, as well as the willingness of school leaders to make classroom space available to outside (and often private) vendors. This is particularly problematic for English-language learners and for students with special education needs. Evidence suggests that the extent of SES programs available to English-language learners and students with special education needs is limited (Burch, Steinberg, & Donovan, 2007).

Taken together, the extent of participation in SES is driven by a dynamic process shaped by myriad factors. For the purposes of this article, I explore the student-level characteristics that may be related to the decision to participate in additional academic instruction. The empirical analysis focuses on the extent to which an

TABLE 1
*SES Eligibility and Participation by Cohort*

| | 2004–2005 | 2005–2006 | 2006–2007 | 2007–2008 |
|---|---|---|---|---|
| SES-eligible students | 213,928 | 198,788 | 169,841 | 177,411 |
| SES participants | 58,699 | 39,253 | 36,578 | 36,216 |
| Take-up rate | 27.4% | 19.8% | 21.5% | 20.4% |
| Eligible schools | 341 | 320 | 297 | 286 |

*Note.* SES = Supplemental Educational Services. SES-eligible students are in Grades 1 to 12 for the given school year. The take-up rate is the share of SES-eligible students participating in SES in a given cohort year.

TABLE 2
*SES Eligibility and Participation Across Cohorts*

| | 2004–2005 to 2007–2008 | 2005–2006 to 2007–2008 | 2006–2007 to 2007–2008 |
|---|---|---|---|
| SES eligible | 79,096 | 100,615 | 123,807 |
| SES participants | 1,421 | 3,313 | 11,050 |
| Take-up rate | 1.8% | 3.3% | 8.9% |
| Eligible schools | 252 | 263 | 277 |

*Note.* SES = Supplemental Educational Services. SES-eligible students are in Grades 1 to 12 in the earliest school year. SES participants were in Grades 1 to 12 during the earliest school year and were SES eligible and SES participants in each of the school years. The take-up rate is the share of SES-eligible students who participated in SES in each school year for the given range of school years.

SES-eligible student's cognitive achievement and noncognitive characteristics are related to SES participation. A student's cognitive achievement likely reflects whether that student is in need of additional academic instruction. A student's noncognitive characteristics, such as motivation and school engagement, are often unobserved character traits that are a measure of the student's ability set with implications for important educational outcomes (Heckman & Rubinstein, 2001). For the purposes herein, I consider that a student's engagement in school and motivation to succeed and to seek out additional academic instruction will be reflected in his or her school attendance and behavior.

I also explore the extent of school-level heterogeneity in SES participation. Students who attend the same schools will have similar information (likely provided to them by teachers and peers) about the SES programs available to them both within and outside school. As such, I consider the nested nature of SES choice decisions (students choosing SES within schools) to account for school-level differences in information about the type of tutoring services offered and other unobserved demand- and supply-side factors influencing SES participation. I proceed now by describing the data, variables, and empirical approaches for exploring the factors related to SES participation.

## Data and Variables

The data used in this analysis include both administrative and survey data. The administrative data include student-level demographic and achievement data, information on student behavior (including student absences and disciplinary infractions), and SES eligibility and participation for the school years 2004–2005 through 2007–2008. The survey data are from the Student Connection Survey, which was administered by Chicago Public Schools (CPS) to students (Grades 9–12 in 2005–2006 and Grades 6–12 in 2006–2007 and again in 2007–2008) in an effort to develop an understanding of students' perceptions of the school environment and how the environment affects student achievement and learning. Table 1 summarizes SES eligibility and participation by cohort year, and Table 2 summarizes SES eligibility and participation across cohort years.

The dependent variable is a binary variable indicating whether an SES-eligible student participated in SES in a given school year.[9] The student-level factors include (a) student demographics, (b) cognitive achievement measures,

TABLE 3
*Demographic Characteristics by Cohort Year*

| Student characteristic | 2004–2005 | | 2005–2006 | | 2006–2007 | | 2007–2008 | |
|---|---|---|---|---|---|---|---|---|
| | % of SES | Take-up rate | % of SES | Take-up rate | % of SES | Take-up rate | % of SES | Take-up rate |
| Male | 49.1% | 26.7% | 49.6% | 19.4% | 49.2% | 20.9% | 49.9% | 20.1% |
| Female | 50.9% | 28.2% | 50.4% | 20.1% | 50.8% | 22.1% | 50.1% | 20.7% |
| Black | 62.5% | 29.4% | 55.6% | 18.4% | 69.6% | 23.6% | 61.1% | 21.5% |
| Hispanic | 35.3% | 25.5% | 41.9% | 22.5% | 28.8% | 18.6% | 37.3% | 19.7% |
| Other | 2.2% | 16.4% | 2.5% | 13.4% | 1.6% | 11.0% | 1.6% | 9.6% |
| Free lunch | NA | NA | 91.0% | 20.5% | NA | NA | 92.8% | 23.4% |
| Reduced-price lunch | NA | NA | 5.9% | 17.1% | NA | NA | 5.9% | 19.4% |
| Bilingual (currently) | NA | NA | 22.2% | 36.2% | NA | NA | NA | NA |
| Bilingual (formerly) | NA | NA | 19.1% | 15.9% | NA | NA | NA | NA |
| Bilingual (never) | NA | NA | 58.7% | 18.0% | NA | NA | NA | NA |
| Disabled | 12.6% | 23.3% | 16.2% | 21.4% | 14.6% | 20.5% | 13.8% | 19.8% |
| Elementary school (Grades 1–5) | 65.6% | 38.5% | 59.6% | 26.5% | 62.8% | 33.8% | 63.9% | 32.1% |
| Middle school (Grades 6–8) | 29.9% | 29.5% | 27.3% | 19.4% | 28.2% | 22.3% | 29.0% | 21.7% |
| High school (Grades 9–12) | 4.5% | 4.9% | 13.1% | 9.3% | 9.0% | 6.0% | 7.1% | 4.5% |

*Note.* NA = data on a particular student characteristic were unavailable for a given cohort year; SES = Supplemental Educational Services. The percentage of SES is the share of SES participants in a given cohort year by student characteristic. The take-up rate is the proportion of SES-eligible students, by student characteristic, who participated in SES in a cohort year. "Other" includes students who are White, Asian, or Native American. Students identified as disabled had individualized education plans in a given school year.

(c) noncognitive measures, and (d) student perceptions of the school environment. Table 3 summarizes student demographics, including gender, race, grade, disability status, lunch status, and English proficiency status. A student is disabled if he or she has an individualized education plan in a given school year. Students pay for lunch, receive free lunch, or receive reduced-price lunch.[10] A student's English proficiency status is characterized as never bilingual, formerly bilingual, or currently in a bilingual program for a given school year.[11]

For cognitive assessments, elementary school students (Grades 1–8) were tested in mathematics and reading on the Iowa Test of Basic Skills (ITBS) prior to the 2005–2006 school year, which was mandatory for students in Grades 3 through 8. Beginning in 2005–2006 and continuing through the 2007–2008 school year, students in Grades 3 through 8 were tested in mathematics and reading proficiency on the Illinois Standards Achievement Test (ISAT).[12]

High school students (Grades 9–12) do not take a common standardized test, as do students in the elementary grades. As such, I use a series of cognitive achievement measures. The first is the cumulative grade point average (GPA), which is the end-of-year GPA for all high school classes taken up through and including the most recently completed academic semester. I also explore a student's fall and spring GPA in the year prior to eligibility for SES; the fall (spring) GPA is the student's GPA from courses taken only in the fall (spring) semester of the school year. I also examine the high-stakes exam for high school students, the Prairie State Achievement Examination (PSAE), which is given to students in Grade 11.

Test score (ITBS, ISAT, and PSAE) and GPA data are standardized within school year (e.g., *z* scores for the prior-year ITBS or ISAT are created for elementary school students within a school year; *z* scores for the prior-year PSAE and the cumulative, fall, and spring prior-year GPA are created for high school students for a given school year). Prior-year cognitive achievement results are used to assess the extent to which a student's performance in the prior year is related to the decision to participate in SES in the subsequent school year. The direction of this effect (e.g., whether lower achieving students in the prior academic year are more likely to take up SES than higher achieving students) is an empirical question that is tested herein.

The noncognitive measures include student attendance and behavior. Student attendance is the total number of school absences in a given school year: the sum of fall and spring semester absences.[13] School attendance data are available only for high school students. The total number of prior-year absences is included in the empirical analysis to explore the extent to which a student's school attendance in the prior year is related to the likelihood of participating in SES in the subsequent school year.

Student behavior is measured as the total number of disciplinary infractions in a school year; data are available for the 2005–2006 and 2006–2007 school years for all grades. To account for heterogeneity across students in the severity of infractions, I include a variable for the most severe infraction (in the case in which students have multiple infractions), measured on a scale ranging from 1 to 6.[14] The total number of prior-year disciplinary infractions is included in the empirical analysis. Similar to student attendance, consideration is given to whether a student's behavior in the prior school year motivates participation in SES in the subsequent school year.

Data on how students in the middle and high school grades (Grades 6–12) perceive various dimensions of their school environment and schooling experiences come from the Student Connection Survey. The survey, administered by CPS, measured student perceptions on four dimensions: (a) school safety, (b) teacher expectations, (c) teacher support, and (d) social and emotional learning. Each dimension is an aggregate of a series of survey questions, which were then scaled to reflect whether the student perceived the school to be excellent, adequate, or in need of improvement on each of the four dimensions. School safety captures how physically and emotionally safe students feel in school. Teacher expectations captures the extent to which students perceive that teachers and other adults in their school encourage them to think, work hard, do their best, and connect what they are learning in school to life outside school. The teacher support dimension captures how much students feel listened to, cared about, and helped by teachers and other adults in the school. Social and emotional learning is a measure of the level of social capital in the school, capturing students' perceptions of their peers' social and problem-solving skills. Each of the four dimensions was dichotomized; a value of 1 was given to a student who perceived the school to be adequate or excellent on a given dimension and a value of 0 for a student who perceived that the school needed improvement on this dimension.

The data on student survey responses provide a deeper understanding of student interactions with their school environment, including both their teachers and their peers. No previous empirical studies of participation in educational choice options model the context of schooling in the manner in which the survey data allow. Given that there is likely heterogeneity both across and within schools in how students perceive their schooling experiences, these data provide the opportunity to model the extent to which school setting relates to SES participation.

## Empirical Analysis

Three empirical approaches are used to estimate SES participation among SES-eligible students: (a) descriptive analysis of the extent of differential selection by SES participation status, (b) cohort analyses of the student-level factors related to SES participation, and (c) longitudinal analysis of SES participation for students eligible for SES during both the 2006–2007 and 2007–2008 school years. The descriptive analysis provides a snapshot of the composition of SES participants and nonparticipants across cohort years. The cohort analyses explore the extent to which differences in the conditional probability of SES participation exist across cohort years, controlling for school-level unobserved heterogeneity (e.g., demand and supply factors that influence SES participation but are not explicitly observed, such as the amount and quality of information provided by schools to students and families about SES provider options). The longitudinal analysis controls for time-invariant student characteristics (such as family and student preferences for additional academic instruction provided by SES), in addition to unobserved factors at the school level, which might confound cohort-level estimates. The longitudinal analysis also allows for an assessment of the within-student variation in SES participation over time. Together, these empirical approaches

provide a rich perspective of SES participation in Chicago.

### *Descriptive Evidence of Differential Selection*

Table 4 presents initial evidence of differential selection into SES in Chicago. SES participants in Grades 1 to 8 have lower prior-year math and reading achievement than nonparticipants. For students who took the high-stakes PSAE test in the prior year (e.g., students who were in Grade 11 in the prior school year but who were eligible for SES in the subsequent school year), the results are quite similar to those for younger students. In almost all instances (PSAE math and reading differences by cohort year), SES participants performed below nonparticipants on the high-stakes high school exam.[15] However, the PSAE is limited in that I can only assess mean differences for a single grade within a cohort year. As such, I look at student GPA across participation status and within a cohort year. Three measures of prior-year GPA are used: (a) cumulative GPA, (b) GPA for the fall semester just prior to the cohort year under consideration, and (c) GPA for the spring semester just prior to the cohort year under consideration. SES participants and nonparticipants in 2004–2005 and 2005–2006 do not differ in prior-year cumulative, spring, or fall GPAs. For the 2006–2007 cohort, SES participants had lower prior-year cumulative, spring, and fall GPAs relative to nonparticipants, at the magnitude of 0.10 to 0.15 standard deviations. However, for the 2007–2008 cohort, I find a different pattern with respect to course performance between SES participants and nonparticipants. In particular, although there is no statistically significant difference in cumulative GPA between participants and nonparticipants, SES participants perform, on average, approximately 0.10 standard deviations higher than nonparticipants in terms of fall and spring GPAs. The extent to which these different patterns are related to structural changes in the provision of SES (e.g., school- or district-level policies aimed at recruiting students on the basis of characteristics of their course performance) or supply-side changes (e.g., SES providers whose curricula may be correlated with course performance) is beyond the scope of this analysis; however, a better understanding of the factors that drove this change in relative in-school performance among SES participants and nonparticipants across cohort years is worth exploring.

Evidence on the relationship between school absences and SES participation (among high school students) suggests variation in the composition of students across cohort years. In particular, in only two of four cohorts is the difference in prior-year absences significant between SES participants and nonparticipants, and the magnitude (and level of statistical significance) varies across these two cohorts.

However, evidence on student behavior and SES participation status appears rather consistent. For the 2006–2007 cohort, SES participants had fewer prior-year disciplinary infractions than nonparticipants. On average, SES participants in the 2006–2007 cohort had 0.167 prior-year disciplinary infractions, compared with 0.373 prior-year infractions for nonparticipants (a statistically significant difference at $p < .000$). Similarly, for the 2007–2008 cohort, SES participants had statistically significantly ($p < .000$) fewer prior-year disciplinary infractions than nonparticipants.

In sum, a few trends emerge from the descriptive analysis. First, for all high-stakes tests (ITBS, ISAT, and PSAE) in math and reading across almost all cohort years, SES participants score lower on average than nonparticipants in the year prior to SES eligibility. Second, there appears to be inconsistent evidence on the relationship between high school coursework grades and SES participation. Third, evidence suggests that student behavior is related to SES participation, with some evidence that school absences are related to SES participation among high school students.

### *Cohort Analysis*

I now estimate the probability that an SES-eligible student participated in SES for each cohort year, 2004–2005 through 2007–2008. Given the multilevel structure of the data—students nested within schools—the conditional probability of participating is

$$E(Y_{ij} \mid \mathbf{X}_{ij}) = \Pr(Y_{ij} = 1 \mid \mathbf{X}_{ij}) = \mu_{ij}, \qquad (1)$$

where $Y_{ij}$ takes on a value of 1 if student $i$ in school $j$ participates in SES and a value of 0 if

TABLE 4

*Student Cognitive and Noncognitive Characteristics by Cohort Year*

| | 2004–2005 | | 2005–2006 | | 2006–2007 | | 2007–2008 | |
|---|---|---|---|---|---|---|---|---|
| Student measure | SES | No SES | SES | No SES | SES | No SES | SES | No SES |
| Math (ITBS/ISAT) | –0.246*** | 0.117 | –0.326*** | 0.091 | –0.317*** | 0.097 | –0.336*** | 0.096 |
| | (0.889) | (1.028) | (0.857) | (1.017) | (0.945) | (0.996) | (0.942) | (0.995) |
| Reading (ITBS/ISAT) | –0.247*** | 0.117 | –0.419*** | 0.117 | –0.284*** | 0.087 | –0.314*** | 0.090 |
| | (0.874) | (1.034) | (0.819) | (1.014) | (0.975) | (0.991) | (0.965) | (0.992) |
| Math (PSAE) | –0.152* | 0.002 | –0.087** | 0.006 | –0.173*** | 0.008 | –0.427*** | 0.015 |
| | (1.035) | (0.999) | (0.937) | (1.004) | (1.021) | (0.998) | (0.862) | (1.001) |
| Reading (PSAE) | –0.156* | 0.003 | 0.002 | –0.0001 | –0.201*** | 0.009 | –0.335*** | 0.012 |
| | (1.083) | (0.999) | (1.009) | (0.999) | (0.994) | (0.999) | (0.873) | (1.002) |
| GPA (cumulative) | 0.041 | –0.002 | 0.023 | –0.002 | –0.098*** | 0.005 | 0.036 | –0.002 |
| | (1.064) | (0.997) | (1.072) | (0.993) | (1.007) | (0.999) | (0.924) | (1.003) |
| GPA (fall term) | 0.003 | –0.0001 | 0.012 | –0.001 | –0.151*** | 0.008 | 0.099*** | –0.004 |
| | (1.039) | (0.998) | (1.053) | (0.995) | (1.025) | (0.998) | (0.923) | (1.003) |
| GPA (spring term) | 0.033 | –0.002 | 0.023 | –0.002 | –0.085*** | 0.004 | 0.109*** | –0.005 |
| | (1.046) | (0.998) | (1.052) | (0.995) | (1.034) | (0.998) | (0.939) | (1.002) |
| Absences | 17.02 | 17.72 | 16.68* | 17.31 | 18.16 | 18.15 | 12.38*** | 14.98 |
| | (16.96) | (18.65) | (17.81) | (19.20) | (18.99) | (18.82) | (12.52) | (14.84) |
| Disciplinary infractions | NA | NA | NA | NA | 0.167*** | 0.373 | 0.189*** | 0.445 |
| | | | | | (0.740) | (1.24) | (0.782) | (1.49) |

*Note.* GPA = grade point average; ISAT = Illinois Standards Achievement Test; ITBS = Iowa Test of Basic Skills; NA = data on a particular student measure were unavailable for a given cohort year; PSAE = Prairie State Achievement Examination; SES = Supplemental Educational Services. In each cell, the mean value is provided, with the standard deviation in parentheses. For all student measures except absences and disciplinary infractions, the cell values are *z* scores. The mean numbers of prior-year absences and disciplinary infractions are included (with standard deviations in parentheses) for each cohort, where available. For the 2004–2005 cohort: prior-year ITBS math and reading scores standardized for SES-eligible students who were in testing grades during the 2003–2004 school year (Grades 1–8); prior-year PSAE math and reading scores standardized for SES-eligible students who were tested during the 2003–2004 year (Grade 11); prior-year end-of-year cumulative GPA for all classes taken in high school (Grades 9–12) up through and including the 2003–2004 school year standardized for SES-eligible students in 2004–2005 who were in high school during the 2003–2004 school year; prior-year GPA for fall (spring) term for courses taken only in the fall (spring) semester of the 2003–2004 school year; total number of absences in the prior school year (2003–2004) available only for SES-eligible high school students; number of prior-year disciplinary infractions unavailable for the 2004–2005 cohort. For the 2005–2006 cohort: prior-year ITBS math and reading score standardized for SES-eligible students who were in testing grades during the 2004–2005 school year (i.e., Grades 1–8); prior-year PSAE math and reading scores standardized for SES-eligible students who were tested during the 2004–2005 year (Grade 11); prior-year end-of-year cumulative GPA for all classes taken in high school (Grades 9–12) up through and including the 2004–2005 school year standardized for SES-eligible students in 2005–2006 who were in high school during the 2004–2005 school year; prior-year GPA standardized for fall (spring) term for courses taken only in the fall (spring) semester of the 2004–2005 school year; total number of absences in the prior school year (2004–2005) available only for SES-eligible high school students; number of prior-year disciplinary infractions unavailable for the 2005–2006 cohort. For the 2006–2007 cohort: prior-year ISAT math and reading score standardized for SES-eligible students who were in testing grades during the 2005–2006 school year (i.e., Grades 3–8); prior-year PSAE math and reading scores standardized for SES-eligible students who were tested during the 2005–2006 year (Grade 11); prior-year end-of-year cumulative GPA for all classes taken in high school (Grades 9–12) up through and including the 2005–2006 school year standardized for SES-eligible students in 2006–2007 who were in high school during the 2005–2006 school year; prior-year GPA standardized for fall (spring) term for courses taken only in the fall (spring) semester of the 2005–2006 school year; total number of absences in the prior school year (2005–2006) available only for SES-eligible high school students; number of prior-year disciplinary infractions available for all SES-eligible students (Grades 1–12). For the 2007–2008 cohort: prior-year ISAT math and reading score standardized for SES-eligible students who were in testing grades during the 2006–2007 school year (i.e., Grades 3–8); prior-year PSAE math and reading scores standardized for SES-eligible students who were tested during the 2006–2007 year (Grade 11); prior-year end-of-year cumulative GPA for all classes taken in high school (Grades 9–12) up through and including the 2006–2007 school year standardized for SES-eligible students in 2007–2008 who were in high school during the 2006–2007 school year; prior-year GPA standardized for fall (spring) term for courses taken only in the fall (spring) semester of the 2006–2007 school year; total number of absences in the prior school year (2006–2007) available only for the spring semester and for SES-eligible high school students; number of prior-year disciplinary infractions available for all SES-eligible students (Grades 1–12).

*Statistically significant difference between SES participants and nonparticipants at the 10% level. **Statistically significant difference between SES participants and nonparticipants at the 5% level. ***Statistically significant difference between SES participants and nonparticipants at the 1% level.

student $i$ in school $j$ does not participate in SES in a given cohort year; $\mathbf{X}_{ij}$ is a vector of observed student characteristics; Pr(·) is the conditional probability that student $i$ in school $j$ participates in SES in a given school year; and $\mu_{ij}$ is the student-specific predicted probability of participating in SES.

A logit link function is used to link the linear predictor ($\mathbf{X}'_{ij}\beta$) to the mean response parameter ($\mu_{ij}$) and is specified as

$$\text{logit}(\mu_{ij}) = \eta_{ij} = \log\left(\frac{\mu_{ij}}{1-\mu_{ij}}\right) = \mathbf{X}'_{ij}\beta_j . \quad (2)$$

I use an adaptive centering approach with random effects to model the SES participation decision (Raudenbush, 2009). This approach centers all student-level covariates at the school level, functionally equivalent to including school fixed effects in a generalized linear modeling (GLM) framework.

This approach has two substantive advantages over GLM. First, it incorporates the clustering that arises in the context of students making SES selection decisions within different school settings. By better capturing the nested structure of the SES participation decision, more efficient inferences can be made. Second, this approach models heterogeneous effects across schools. In comparison with generalized linear models, in which the coefficients are fixed across schools, multilevel models (in this case, using adaptive centering) allow the coefficients to vary randomly across schools, modeling school-level differences in the conditional probability of participating in SES (Raudenbush, 2009).

I estimate a two-level model (students nested within schools) for each of the 4 cohort years. These models are estimated separately for students in the elementary (Grades 1–5), middle (Grades 6–8), and high (Grades 9–12) school grades to account for the possibility that the decision-making unit (families, parents, students) differs across school levels. The Level 1 model is

$$\eta_{ij} = \beta_{0j} + \sum_{q=1}^{Q}\beta_{qj}(\mathbf{X}_{qij} - X_{q\cdot j}) , \quad (3)$$

where $\beta_{0j}$ is the intercept for school $j$; $\mathbf{X}_{qij}$ are $q = 1, \ldots, Q$ student characteristics that predict the probability of participating in SES; and $X_{q\cdot j}$ is the school-level mean for covariate $q$. With a $Q$-dimensional vector of student-level covariates, the Level 2 model is

$$\beta_{qj} = \gamma_{q0} + \mu_{qj}, \quad (4)$$

where $\beta_{qj}$ corresponds to the $q$th coefficient for the $j$th school, $\gamma_{q0}$ is the average expected probability (e.g., log odds) of the $q$th covariate for the population of all schools, and $\mu_{qj}$ is the random effect of the $q$th covariate for school $j$. The random effect $\mu$ captures the variability across schools in the intercept ($\beta_{0j}$) and slopes ($\beta_{qj}$ for $q > 0$) that is not captured by simply including school-specific indicator variables (in a GLM framework). I include random effects for the school average probability of participating in SES ($\mu_{0j}$) and for prior-year SES participation and prior-year cognitive achievement (prior-year reading test score for the cohort models with Grades 1–8 and prior-year GPA for the cohort model with Grades 9–12).

I then assess the extent to which between- and within-school variability is associated with SES choice, using the conditional intraclass correlation coefficient ($\rho$) to explore within- and between-school variation in the probability of SES participation.[16]

Tables 5 to 7 summarize the cohort results.[17] Female students in Grades 1 to 5 (see Table 5) have greater odds of participating in SES than male students. For all cohorts except 2007–2008, Black students have greater odds of participating in SES than Hispanic and other-race students. Students in Grades 1 and 2 are less likely to participate in SES than those in Grade 5, and students in Grade 3 are consistently more likely to participate in SES. This result likely reflects the fact that Grade 3 is a promotion grade in CPS, and students who do not pass the high-stakes exams are subject to grade retention. As such, parents and teachers alike may enroll third graders in SES to mitigate the possibility of grade retention. There is consistent evidence that students with prior exposure to SES are more likely to participate in SES in the current school year. Evidence from Table 5 also suggests that lower performing elementary school students are more likely to participate in SES than higher achieving students. Finally, it does not appear that the number of prior-year disciplinary infractions (controlling for the severity of the infraction) is

TABLE 5
*Elementary School Students (Grades 1–5): Cohort Models*

| Variable | 2004–2005 | 2005–2006 | 2006–2007 | 2007–2008 |
|---|---|---|---|---|
| Fixed effects | | | | |
| Intercept | 0.5405*** | 0.2983*** | 0.5165*** | 0.4417*** |
| | (0.1312) | (0.0640) | (0.0457) | (0.0678) |
| Male (female) | 0.8675*** | 0.8640*** | 0.8707*** | 0.8824*** |
| | (0.0174) | (0.0230) | (0.0310) | (0.0335) |
| Hispanic (Black) | 0.9022*** | 0.8865** | 0.8457** | 0.9556 |
| | (0.0296) | (0.0523) | (0.0660) | (0.0745) |
| Other (Black) | 0.7148*** | 0.6839*** | 0.7602** | 0.8474 |
| | (0.0665) | (0.1045) | (0.1391) | (0.1402) |
| Grade 1 (Grade 5) | 0.5842*** | 0.1298*** | NA | NA |
| | (0.1149) | (0.1337) | | |
| Grade 2 (Grade 5) | 0.8173*** | 0.2162*** | NA | NA |
| | (0.0218) | (0.0261) | | |
| Grade 3 (Grade 5) | 1.0805*** | 1.932*** | 1.427*** | 1.507*** |
| | (0.0184) | (0.0231) | (0.06982) | (0.0649) |
| Grade 4 (Grade 5) | 1.0257 | 0.9441*** | 1.082*** | 1.161*** |
| | (0.0179) | (0.0215) | (0.0257) | (0.0279) |
| Disability (no disability) | 0.7910*** | 0.8866** | 1.068 | 1.063 |
| | (0.0345) | (0.0474) | (0.0483) | (0.0545) |
| Free lunch (reduced-price lunch) | NA | 0.9778 | NA | 0.9958 |
| | | (0.0497) | | (0.0781) |
| Formerly bilingual (never bilingual) | NA | 1.263*** | NA | NA |
| | | (0.0521) | | |
| Currently bilingual (never bilingual) | NA | 1.814*** | NA | NA |
| | | (0.0533) | | |
| Prior-year SES | NA | 1.597*** | 1.846*** | 2.259*** |
| | | (0.0477) | (0.0333) | (0.0332) |
| Prior-year reading exam (*z* score) | 0.8009*** | 0.4956*** | 0.959** | 0.9229*** |
| | (0.0070) | (0.0111) | (0.0179) | (0.0184) |
| Disciplinary infractions (prior year) | NA | NA | 0.9235 | 0.9706 |
| | | | (0.0574) | (0.0569) |
| Random effects | | | | |
| School mean, $\mu_{0j}$ | 1.935*** | 0.65019*** | 0.3448*** | 0.6091*** |
| | (285) | (262) | (234) | (217) |
| | [9,092.118] | [3,682.515] | [1,514.157] | [1,679.469] |
| Prior-year SES | NA | 0.09649*** | 0.0311* | 0.04303*** |
| | | (262) | (234) | (217) |
| | | [436.814] | [264.919] | [275.916] |
| Prior-year reading exam | 0.0649*** | 0.17331*** | 0.0256*** | 0.02842*** |
| | (285) | (262) | (234) | (217) |
| | [860.546] | [1,269.612] | [320.794] | [297.995] |
| SES-eligible students (schools) | 58,785 | 52,119 | 21,971 | 21,977 |
| | (288) | (266) | (236) | (225) |

*Note.* NA = not available. SES = Supplemental Educational Services. For fixed effects, odds ratios are reported with standard errors (of the log odds coefficient) in parentheses. The reference category is listed in parentheses. Prior-year SES is an indicator of whether a student participated in SES in the prior school year. Prior-year reading exam is the standardized score on the prior year's reading exam. Disciplinary infractions are measured as the total number of times disciplined during the prior school year. The model also includes controls for the severity of disciplinary infractions (not reported). For random effects, variance is reported, with degrees of freedom in parentheses and $\chi^2$ statistics in brackets. Fixed and random effects are computed using EM-Laplace estimation (unit-specific model).
*Statistically significant at the 10% level. **Statistically significant at the 5% level. ***Statistically significant at the 1% level.

TABLE 6
*Middle School Students (Grades 6–8): Cohort Models*

| Variable | 2004–2005 | 2005–2006 | 2006–2007 | 2007–2008 |
|---|---|---|---|---|
| Fixed effects | | | | |
| Intercept | 0.3126*** | 0.1478*** | 0.2719*** | 0.2099*** |
| | (0.1381) | (0.0909) | (0.060) | (0.0849) |
| Male (female) | 0.7961*** | 0.8702*** | 0.8503*** | 0.9108*** |
| | (0.0208) | (0.0239) | (0.0281) | (0.0352) |
| Hispanic (Black) | 0.8642*** | 0.8269** | 0.8213*** | 0.8054*** |
| | (0.0346) | (0.0823) | (0.0452) | (0.0801) |
| Other (Black) | 0.6333*** | 0.7047*** | 0.6818* | 0.6439** |
| | (0.0580) | (0.1230) | (0.1122) | (0.0207) |
| Grade 6 (Grade 8) | 1.0263* | 0.5750*** | 1.376*** | 1.003 |
| | (0.0144) | (0.0206) | (0.0237) | (0.1057) |
| Grade 7 (Grade 8) | 0.8487*** | 0.6550*** | 0.9806 | 0.9036*** |
| | (0.0139) | (0.0228) | (0.0209) | (0.0265) |
| Disability (no disability) | 0.7693*** | 0.7489*** | 1.040 | 1.099 |
| | (0.0429) | (0.0400) | (0.0451) | (0.0678) |
| Free lunch (reduced-price lunch) | NA | 1.062 | NA | 0.9879 |
| | | (0.0549) | | (0.08012) |
| Formerly bilingual (never bilingual) | NA | 1.131 | NA | NA |
| | | (0.0796) | | |
| Currently bilingual (never bilingual) | NA | 1.209** | NA | NA |
| | | (0.0961) | | |
| Prior-year SES | NA | 1.637*** | 1.845*** | 2.862*** |
| | | (0.0804) | (0.0246) | (0.0392) |
| Prior-year reading exam ($z$ score) | 0.8103*** | 0.3588*** | 0.9133*** | 0.8636*** |
| | (0.0065) | (0.0079) | (0.0112) | (0.0229) |
| Disciplinary infractions (prior year) | NA | NA | 0.9686 | 0.9509 |
| | | | (0.0559) | (0.0582) |
| Teacher expectations | NA | NA | NA | 0.9731 |
| | | | | (0.0326) |
| Teacher support | NA | NA | NA | 1.095** |
| | | | | (0.0400) |
| School safety | NA | NA | NA | 0.9239** |
| | | | | (0.0309) |
| Social/emotional learning | NA | NA | NA | 1.057* |
| | | | | (0.0314) |
| Random effects | | | | |
| School mean, $\mu_{0j}$ | 2.2914*** | 1.1301*** | 0.6476*** | 0.9354*** |
| | (299) | (279) | (244) | (211) |
| | [8,838.478] | [5,055.995] | [3,455.649] | [2283.846] |
| Prior-year SES | NA | 0.0917*** | 0.1241*** | 0.1084*** |
| | | (279) | (244) | (211) |
| | | [392.131] | [355.230] | [274.668] |
| Prior-year reading exam | 0.1237*** | 0.3860*** | 0.0558*** | 0.0690*** |
| | (299) | (279) | (244) | (211) |
| | [1,187.861] | [1,920.397] | [546.198] | [354.702] |
| SES-eligible students (schools) | 53,802 | 50,212 | 40,266 | 22,890 |
| | (305) | (293) | (248) | (231) |

*Note.* NA = not available. SES = Supplemental Educational Services. For fixed effects, odds ratios are reported with standard errors (of the log odds coefficient) in parentheses. The reference category is listed in parentheses. Prior-year SES is an indicator of whether a student participated in SES in the prior school year. Prior-year reading exam is the standardized score on the prior year's reading exam. Disciplinary infractions are measured as the total number of times disciplined during the prior school year. The model also includes controls for severity of disciplinary infractions (not reported). Teacher expectations, teacher support, school safety, and social/emotional learning are indicators of whether a student believes the school is adequate or excellent, from the prior year's Student Connection Survey, along a particular dimension, where the reference category is that the student believes the school needs improvement along a particular domain of school environment. For random effects, variance is reported, with degrees of freedom in parentheses and $\chi^2$ statistics in brackets. Fixed and random effects are computed using EM-Laplace estimation (unit-specific model).

*Statistically significant at the 10% level. **Statistically significant at the 5% level. ***Statistically significant at the 1% level.

TABLE 7
*High School Students (Grades 9–12): Cohort Models*

| Variable | 2004–2005 | 2005–2006 | 2006–2007 | 2007–2008 |
|---|---|---|---|---|
| Fixed effects | | | | |
| Intercept | 0.0115*** | 0.0544*** | 0.0348*** | 0.0223*** |
| | (0.5597) | (0.2671) | (0.2654) | (0.5399) |
| Male (female) | 0.7047*** | 0.8977 | 0.9499 | 1.029 |
| | (0.0584) | (0.0662) | (0.1052) | (0.1883) |
| Hispanic (Black) | 0.8482 | 0.5757*** | 0.6377*** | 0.6811 |
| | (0.1099) | (0.1448) | (0.1672) | (0.2751) |
| Other (Black) | 0.8678 | 0.6678 | 0.5986 | 0.7591 |
| | (0.1680) | (0.3061) | (0.3243) | (0.4790) |
| Grade 9 (Grade 12) | 1.908*** | 1.300*** | 1.401** | 1.431 |
| | (0.0881) | (0.0970) | (0.1534) | (0.4842) |
| Grade 10 (Grade 12) | 1.988*** | 1.707*** | 1.328*** | 1.077 |
| | (0.0683) | (0.0311) | (0.0633) | (0.1494) |
| Grade 11 (Grade 12) | 5.176*** | 1.829*** | 1.486*** | 1.605*** |
| | (0.0508) | (0.0446) | (0.0900) | (0.1253) |
| Disability (no disability) | 0.8880 | 1.016 | 1.025 | 1.237 |
| | (0.5283) | (0.2895) | (0.2504) | (0.3719) |
| Free lunch (reduced-price lunch) | NA | 0.9486 | NA | 1.024 |
| | | (0.1573) | | (0.3236) |
| Formerly bilingual (never bilingual) | NA | 1.259* | NA | NA |
| | | (0.1391) | | |
| Currently bilingual (never bilingual) | NA | 1.887*** | NA | NA |
| | | (0.1655) | | |
| Prior-year SES | NA | 1.445 | 1.984*** | 2.535*** |
| | | (0.4479) | (0.0946) | (0.2592) |
| Prior-year grade point average (*z* score) | 0.8513*** | 0.9399*** | 0.7231*** | 0.8060** |
| | (0.0342) | (0.0155) | (0.0645) | (0.0908) |
| Disciplinary infractions (prior year) | NA | NA | 0.9857 | 0.9276 |
| | | | (0.1019) | (0.1946) |
| Absences (prior year) | 0.9922*** | 0.9950*** | 0.9933 | 0.9741** |
| | (0.0021) | (0.0013) | (0.0064) | (0.0119) |
| Teacher expectations | NA | NA | 1.043 | 0.9942 |
| | | | (0.1420) | (0.2307) |
| Teacher support | NA | NA | 1.046 | 1.196 |
| | | | (0.1105) | (0.1413) |
| School safety | NA | NA | 0.9885 | 0.9159 |
| | | | (0.0669) | (0.1423) |
| Social/emotional learning | NA | NA | 1.058 | 1.176 |
| | | | (0.0957) | (0.1151) |
| Random effects | | | | |
| School mean, $\mu_{0j}$ | 3.201*** | 1.449*** | 1.500*** | 1.387*** |
| | (48) | (40) | (44) | (47) |
| | [3,483.678] | [3,075.605] | [1,134.010] | [1,134.091] |
| Prior-year SES | NA | 0.3341*** | 0.3163*** | 0.2596* |
| | | (40) | (44) | (47) |
| | | [76.544] | [78.801] | [60.389] |
| GPA | 0.3909*** | 0.4828*** | 0.1667*** | 0.1681*** |
| | (48) | (40) | (44) | (47) |
| | [355.306] | [648.257] | [172.142] | [150.405] |
| SES-eligible students (schools) | 32,166 | 34,737 | 27,259 | 22,219 |
| | (49) | (49) | (54) | (56) |

*Note.* GPA = grade point average; NA = not available. SES = Supplemental Educational Services. For fixed effects, odds ratios are reported with standard errors (of the log odds coefficient) in parentheses. The reference category is listed in parentheses. Prior-year SES is an indicator for whether a student participated in SES in the prior school year. GPA is the standardized GPA for all courses taken in high school up through and including the prior school year. Disciplinary infractions are measured as the total number of times disciplined during the prior school year. Absences are measured as the total number of school absences during the prior school year. The model also includes controls for severity of disciplinary infractions (not reported). Teacher expectations, teacher support, school safety, and social/emotional learning are indicators of whether a student believes the school is adequate or excellent, from the prior year's Student Connection Survey, along a particular dimension, where the reference category is that the student believes the school needs improvement along a particular domain of school environment. For random effects, variance is reported, with degrees of freedom in parentheses and $\chi^2$ statistics in brackets. Fixed and random effects are computed using EM-Laplace estimation (unit-specific model).

*Statistically significant at the 10% level. **Statistically significant at the 5% level. ***Statistically significant at the 1% level.

related to SES participation for elementary school students.

The correlation coefficient (ρ) partitions the variance in the conditional probability of participating in SES into a within- and between-school measure.[18] For the 2004–2005 cohort, 37.0% of the variation lies between schools; note here that this is the most parsimonious model in terms of included covariates. For the 2005–2006, 2006–2007, and 2007–2008 cohort models, ρ is 16.5%, 9.5%, and 15.6%, respectively. As such, most of the variation in the conditional probability of participating in SES lies within schools.

Table 6 captures the cohort-specific models for middle school students. Similar to the findings for elementary students, female students and Black students are consistently more likely to participate in SES. Evidence suggests that seventh grade students have lower odds of participating in SES than eighth grade students. Because eighth grade is a promotion grade in CPS (as are third and sixth grades), eighth grade students may be encouraged to enroll in SES to prepare for both high-stakes state exams (which take place in the spring of the academic year) as well as promotion to high school. Students participating in SES during the previous year are more likely to participate in SES in the current school year. Evidence also suggests that lower performing middle school students are more likely to participate in SES. As with elementary school students, there appears to be no relationship for middle school students between prior-year disciplinary infractions and participation in SES in the current school year. There is some evidence of the role of the school environment on the likelihood that middle school students participate in SES. For the 2007–2008 cohort (the only cohort for which prior-year Student Connection Survey data were available for middle school students), students who, on average, perceived their school environment to be safe were less likely to participate in SES, while students who perceived the level of teacher support and social and emotional learning to be adequate or excellent were more likely to participate in SES. Although these results are suggestive of the role a student's school environment plays in the SES participation decision, none of the statistically significant findings reach the $p = .01$ level.

The intraclass correlation for the 2004–2005 cohort is approximately 41.1%, indicating that the majority of the variation in the conditional probability of participating in SES is within schools. For the 2005–2006, 2006–2007, and 2007–2008 cohorts, ρ is 25.6%, 16.4%, and 22.1%, respectively. Relative to SES-eligible students in the elementary grades, there is more variability between schools than within schools for the middle school grades. This may indicate larger peer effects for middle school students. That is, middle school students who attend schools at which SES participation is higher may be more likely to participate in SES than students who are similar (on observable characteristics) who attend schools at which average SES participation is lower. The larger between-school variation in SES participation among middle school students also supports the notion that older students are more active in the SES choice process than younger students (whose parents are the primary decision makers), as peer effects likely operate through student, as opposed to parental, choice.

Table 7 captures the cohort-specific models for high school students. The results differ rather dramatically from the elementary and middle school results. There is no difference in the probability of participating in SES for Black students relative to students of other races. However, Black students have greater odds of participating in SES relative to Hispanic students in two cohort years. Furthermore, only during the 2004–2005 cohort (again, the most parsimonious model in terms of statistical controls) do female students appear to be more likely to participate in SES than male high school students. However, the role of grade appears relevant, as 11th grade students are consistently more likely to participate in SES than 12th grade students; this is likely because the high-stakes state exam (the PSAE) is given only to 11th graders. Consistent with the elementary and middle school results, participation in SES during the prior school year is strongly predictive of the probability of participating in the current school year; however, this relationship is not statistically significant in the 2005–2006 school year. Similar to the younger grades, higher performing high school students are less likely to participate in SES. Although

there is no evidence that a student's behavior (e.g., disciplinary infractions) is related to participation, students who attend high school more often are also more likely to participate in SES. Interestingly, unlike middle school students, the school environment does not appear to be associated with the probability of participating in SES among high school students in either of the two cohort years for which Student Connection Survey data were available.

The intraclass correlation for high school students is different from the elementary and middle school results. During the 2004–2005, 2005–2006, 2006–2007, and 2007–2008 cohorts, the intraclass correlation is 49.3%, 30.6%, 31.3%, and 29.7%, respectively. Compared with elementary and middle school students, more of the variation in the likelihood of participating in SES is between schools. This result implies that there may be even larger peer effects on SES participation among high school students, again reinforcing the notion that older students are the primary decision makers concerning participation in SES and are likely influenced by their peers' decisions whether or not to participate. Furthermore, this result also reflects the fact that high school students may be less subject to parental and teacher influence than elementary and middle school students.

### *Longitudinal Analysis*

I now explore SES participation over a 2-year period, the 2006–2007 and 2007–2008 school years, explicitly addressing the possibility that unobserved student factors (such as a student's motivation, preference for additional academic services, etc.) may be correlated with cognitive achievement and noncognitive ability, confounding the estimates of the relationship between these policy-relevant parameters and SES participation.

For the purposes of the longitudinal analysis, multiple-year observations are nested within student, with students in turn nested within schools. The Level 1, or observation-level, model is

$$\eta_{kij} = \beta_{0ij} + \sum_{q=1}^{Q} \beta_{qij}(\mathbf{X}_{qkij} - X_{q\cdot ij}), \qquad (5)$$

where $k$ indexes the cohort year, $i$ indexes the student, and $j$ indexes the school. The covariates at Level 1 will be group centered, effectively introducing a student-specific fixed effect into the estimation, as all observation-level data will be taken as deviations from the group, or student, mean. $\beta_{0ij}$ is the intercept for student $i$ in school $j$; $\mathbf{X}_{qkij}$ are $q = 1, \ldots, Q$ student characteristics that predict the probability of participating in SES; and $X_{q\cdot ij}$ is the student-level mean for covariate $q$. To control for the relationship between idiosyncratic time-invariant student characteristics and cognitive and noncognitive ability, I include only time-varying covariates, including measures of a student's cognitive achievement, disciplinary infractions, and school absences. I also include controls for a student's grade level in light of the cohort model results indicating the importance of grade level as a predictor of SES participation, and because grade level represents a proxy for a student's (time-varying) age.[19]

The Level 2, or student-level, model may be written as

$$\beta_{pij} = \gamma_{p0j} + \sum_{q=1}^{Q_p} \gamma_{pqj}(X_{q\cdot ij} - X_{q\cdot\cdot j}) + \mu_{pij}, \qquad (6)$$

where $\gamma_{p0j}$ is the intercept for school $j$ in modeling the student effect $\beta_{pij}$; $X_{q\cdot ij}$ is the within-student mean for covariate $q$, which are taken as deviations from the school-level mean for covariate $q$, $X_{q\cdot\cdot j}$, introducing a school fixed effect into the estimation; and $\mu_{pij}$ is a Level 2 random effect representing the deviation of student $ij$'s Level 1 coefficient, $\beta_{pij}$, from its predicted value on the basis of the student-level (Level 2) model.

Having controlled for student and school fixed effects in Levels 1 and 2, respectively, I allow the Level 2 coefficients, $\gamma_{pqj}$, to vary randomly across schools at Level 3. Modeling school variability at Level 3 allows for school differences in the selection process. The Level 3 model may be written as

$$\gamma_{pqj} = \theta_{pq0} + \upsilon_{pqj}, \qquad (7)$$

where $\theta_{pq0}$ is the mean value of the school-level coefficient across all schools and $\upsilon_{pqj}$ is the Level 3 random effect that represents the deviation of school $j$'s coefficient, $\gamma_{pqj}$, from the school-level mean value.

As with the two-level cohort analysis, I partition the variance across the three levels (observation,

student, and school), estimating the proportion of variance in the probability of participating in SES that is attributable within students (Level 1), between students within schools (Level 2), and between schools (Level 3).[20]

Table 8 summarizes the results from the three-level model for this longitudinal period.[21] For students in Grades 1 to 5, prior-year cognitive achievement and prior-year disciplinary infractions are significantly related to SES participation. When comparing[22] the results for elementary school students with the cohort models, there is evidence that the estimates of prior-year reading achievement and prior-year disciplinary infractions on SES participation are biased upward. From the longitudinal results, students who achieve 1 standard deviation higher, on average, on the prior-year reading exam have approximately 10% lower odds of participating in SES in the subsequent school year. This compares with 4% and 8% lower odds for the 2006–2007 and 2007–2008 cohorts, respectively. There is also evidence of positive selection for prior-year disciplinary infractions. Students who may be more motivated appear to select into SES, to the extent that a student's motivation (and other unobservable characteristics) are correlated with reading achievement and school behavior. From the longitudinal results, students with one more prior-year disciplinary infraction have approximately 11% lower odds of participating in SES in the subsequent school year. This compares with 8% and 3% lower odds for the 2006–2007 and 2007–2008 cohorts, respectively (both cohort estimates are statistically insignificant). The longitudinal results indicate that as elementary school students become older by one grade level, they have 17% lower odds of participating in SES. This finding is similar to the grade-level effects in the cohort models, which found that third and fourth grade students have greater odds of participating in SES than fifth grade students, with greater odds for third grade students compared with fourth grade students. Additionally, I find that a majority of the variance in the probability of participating in SES occurs within schools. In particular, approximately 80% of the total variation in the conditional probability of participating in SES is within students across cohort years, while approximately 10% of the total variation is between students who attend the same school, and approximately 10% of the total variation is between schools.

For students in Grades 6 to 8, similar to elementary school students, prior-year cognitive achievement and prior-year disciplinary infractions are significantly related to SES participation. For an average student who performs 1 standard deviation higher on the prior year's reading exam, the odds of participating in SES are 16% lower. An average student with one more disciplinary infraction in the prior school year has approximately 18% lower odds of participating in SES in the subsequent school year. Therefore, lower performing students and students with fewer disciplinary infractions are more likely to participate in SES. Also, as middle school students age by 1 year, they have 12% lower odds of participating in SES.

As with the findings for elementary school students, there appears to be time-invariant unobserved heterogeneity among middle school students that is correlated with the measure of prior-year cognitive achievement.[23] In particular, from the 2006–2007 cohort model, the odds of participating in SES for a student who performs 1 standard deviation higher on the prior year's reading exam are approximately 9% lower. For the 2007–2008 cohort, the odds of participating are 14% lower, indicating that the inclusion of school environment controls (via the Student Connection Survey) absorbs some of the variation in the probability of participating in SES that is likely captured by unobserved attributes of students. In either case, the fact that the odds of participating in SES as a function of prior-year cognitive achievement are lower in the longitudinal results indicate that there are likely unobserved factors about students (positively) correlated with cognitive achievement that in turn induce an upward (or toward zero) bias in the cohort-specific results.

The direction of the bias in the cohort-specific models for the measure of prior-year disciplinary infractions is similar to that of prior-year cognitive achievement, but the magnitude appears to be rather substantial. Middle school students with one more prior-year disciplinary infraction are 18% less likely to participate in SES; this compares with 3% and 5% lower odds of SES participation for the 2006–2007 and 2007–2008 cohorts. There appear, therefore, to be unobserved

TABLE 8
*Longitudinal Models*

| Variable | Elementary school students | Middle school students | High school students |
|---|---|---|---|
| Fixed effects | | | |
| For intercept, $\beta_{0ij}$ | | | |
| For intercept, $\gamma_{00j}$ | | | |
| Intercept, $\theta_{000}$ | 0.4834*** | 0.2741*** | 0.0353*** |
| | (0.0486) | (0.0554) | (0.1779) |
| For student average cognitive achievement (prior year), $\gamma_{01j}$ | | | |
| Intercept, $\theta_{010}$ | 0.8954*** | 0.8445*** | 0.8869*** |
| | (0.0230) | (0.0260) | (0.0341) |
| For student average disciplinary infractions (prior year), $\gamma_{02j}$ | | | |
| Intercept, $\theta_{020}$ | 0.8948*** | 0.8236*** | 0.9629** |
| | (0.0295) | (0.0296) | (0.0192) |
| For student average absences (prior year), $\gamma_{03j}$ | | | |
| Intercept, $\theta_{030}$ | NA | NA | 0.9806*** |
| | | | (0.0031) |
| For student average grade level, $\gamma_{04j}$ | | | |
| Intercept, $\theta_{040}$ | 0.8262*** | 0.8837*** | 0.8131*** |
| | (0.0339) | (0.0447) | (0.0459) |
| For prior-year cognitive achievement, $\beta_{1ij}$ | | | |
| For intercept, $\gamma_{10j}$ | | | |
| Intercept, $\theta_{100}$ | 0.9429 | 1.018 | 0.6520 |
| | (0.0399) | (0.0436) | (0.26114) |
| For student average cognitive achievement (prior year), $\gamma_{11j}$ | | | |
| Intercept, $\theta_{110}$ | 1.026 | 0.9409 | 0.8115 |
| | (0.0451) | (0.0379) | (0.2461) |
| For student average disciplinary infractions (prior year), $\gamma_{12j}$ | | | |
| Intercept, $\theta_{120}$ | 0.8913 | 0.9663 | 0.7918* |
| | (0.0731) | (0.0603) | (0.1238) |
| For student average absences (prior year), $\gamma_{13j}$ | | | |
| Intercept, $\theta_{130}$ | NA | NA | 0.9741 |
| | | | (0.0176) |
| For student average grade level, $\gamma_{14j}$ | | | |
| Intercept, $\theta_{140}$ | 0.9593 | 1.103 | 1.044 |
| | (0.0712) | (0.0856) | (0.3017) |
| For prior-year disciplinary infractions, $\beta_{2ij}$ | | | |
| For intercept, $\gamma_{20j}$ | | | |
| Intercept, $\theta_{200}$ | 1.006 | 1.039 | 1.000 |
| | (0.0454) | (0.0386) | (0.0446) |
| For student average cognitive achievement (prior year), $\gamma_{21j}$ | | | |
| Intercept, $\theta_{210}$ | 0.9878 | 0.9637 | 1.031 |
| | (0.0409) | (0.0293) | (0.0444) |
| For student average disciplinary infractions (prior year), $\gamma_{22j}$ | | | |
| Intercept, $\theta_{220}$ | 0.9912 | 0.9722** | 0.9909 |
| | (0.0110) | (0.0138) | (0.0063) |
| For student average absences (prior year), $\gamma_{23j}$ | | | |
| Intercept, $\theta_{230}$ | NA | NA | 1.003 |
| | | | (0.0027) |
| For student average grade level, $\gamma_{24j}$ | | | |
| Intercept, $\theta_{240}$ | 0.9459 | 0.9985 | 0.9607 |
| | (0.0469) | (0.0543) | (0.0449) |
| For prior-year absences, $\beta_{3ij}$ | | | |
| For intercept, $\gamma_{30j}$ | | | |
| Intercept, $\theta_{300}$ | NA | NA | 1.004 |
| | | | (0.0075) |
| For student average cognitive achievement (prior year), $\gamma_{31j}$ | | | |
| Intercept, $\theta_{310}$ | NA | NA | 1.001 |
| | | | (0.0069) |

*(continued)*

TABLE 8 (continued)

| Variable | Elementary school students | Middle school students | High school students |
|---|---|---|---|
| For student average disciplinary infractions (prior year), $\gamma_{32j}$ | | | |
| Intercept, $\theta_{320}$ | NA | NA | 0.9967 |
| | | | (0.0024) |
| For student average absences (prior year), $\gamma_{33j}$ | | | |
| Intercept, $\theta_{330}$ | NA | NA | 0.9999 |
| | | | (0.0003) |
| For student average grade level, $\gamma_{34j}$ | | | |
| Intercept, $\theta_{340}$ | NA | NA | 1.007 |
| | | | (0.0076) |
| For grade level, $\beta_{4ij}$ | | | |
| For intercept, $\gamma_{40j}$ | | | |
| Intercept, $\theta_{400}$ | 0.8401*** | 0.8436** | 0.7864 |
| | (0.0587) | (0.0679) | (0.1827) |
| For student average cognitive achievement (prior year), $\gamma_{41j}$ | | | |
| Intercept, $\theta_{410}$ | 0.9326** | 1.011 | 0.9520 |
| | (0.0321) | (0.0299) | (0.0683) |
| For student average disciplinary infractions (prior year), $\gamma_{42j}$ | | | |
| Intercept, $\theta_{420}$ | 1.013 | 1.023 | 1.002 |
| | (0.0514) | (0.0522) | (0.0381) |
| For student average absences (prior year), $\gamma_{43j}$ | | | |
| Intercept, $\theta_{430}$ | NA | NA | 0.9979 |
| | | | (0.0064) |
| For student average grade level, $\gamma_{44j}$ | | | |
| Intercept, $\theta_{440}$ | 1.095 | 1.463*** | 0.7101*** |
| | (0.0603) | (0.0742) | (0.0948) |
| Random effects | | | |
| For intercept ($\beta_{0ij}$), $\mu_{0ij}$ | 0.41360*** | 0.5006*** | 0.1962 |
| | (14,553) | (19,471) | (18,178) |
| | [16,397.887] | [20,292.591] | [15,357.426] |
| For intercept ($\gamma_{00j}$), $\upsilon_{00j}$ | 0.4151 | 0.5766*** | 1.1651*** |
| | (186) | (200) | (39) |
| | [1,629.852] | [2,451.891] | [1,241.971] |
| For intercept ($\gamma_{10j}$), $\upsilon_{10j}$ | 0.07816 | 0.0609 | 0.8535** |
| | (186) | (200) | (39) |
| | [163.897] | [189.251] | [59.289] |
| For intercept ($\gamma_{20j}$), $\upsilon_{20j}$ | 0.1149 | 0.0983 | 0.0038 |
| | (186) | (200) | (39) |
| | [188.412] | [173.869] | [37.012] |
| For intercept ($\gamma_{30j}$), $\upsilon_{30j}$ | NA | NA | 0.0001 |
| | | | (39) |
| | | | [50.225] |
| For intercept ($\gamma_{40j}$), $\upsilon_{40j}$ | 0.5075*** | 0.7760*** | 1.043*** |
| | (186) | (200) | (39) |
| | [731.991] | [1092.269] | [324.947] |
| Level 1 units (Student × Year Observations) | 30,648 | 40,182 | 36,446 |
| Level 2 units (SES-eligible students) | 15,324 | 20,091 | 18,223 |
| Level 3 units (SES-eligible schools) | 198 | 207 | 41 |

*Note.* NA = not available. SES = Supplemental Educational Services. For fixed effects, odds ratios (from unit-specific model) are reported with standard errors (of the log odds coefficient) in parentheses. For random effects, variance is reported, with degrees of freedom in parentheses and $\chi^2$ statistics in brackets. Elementary school students were in Grades 1 to 5 during the 2006–2007 school year, middle school students were in Grades 6 to 8 during the 2006–2007 year, and high school students were in Grades 9 to 12 during the 2006–2007 year. Student-level cognitive achievement measure for elementary and middle school students is the standardized prior year's Illinois Standards Achievement Test reading score; for high school students, the cognitive achievement measure is standardized prior year's cumulative end-of-year grade point average.
*Statistically significant at the 10% level. **Statistically significant at the 5% level. ***Statistically significant at the 1% level.

characteristics of students (perhaps motivation or preference for academic services) that are upwardly biasing (toward zero) the cohort results relative to the longitudinal findings.

The variance decomposition of the conditional probability of participating in SES for middle school students is similar to that which I found for elementary school students. Approximately 75% of the total variation is within students across cohort years, while approximately 12% of the total variation is between students within the same school. As such, a slightly smaller share of the total variation in SES participation for middle school students relative to elementary school students is within schools. Furthermore, approximately 13% of the total variation is between schools, indicating that students in the middle school grades are slightly more similar to their classmates in their probability of participating in SES than elementary school students, indicating that peer effects have a more important influence on middle school students compared with elementary school students.

For high school students, like elementary and middle school students, cognitive achievement in the prior school year (measured by end-of-year cumulative GPA) is a significant predictor of SES participation in the subsequent school year. For two high school students who differ on cumulative GPA by 1 standard deviation, the lower achieving student has approximately 11% greater odds of participating in SES. Prior-year absenteeism (school attendance) is significantly related to SES participation; a student with one more prior-year absence has approximately 2% lower odds of participating in SES in the subsequent school year. Students with one more prior-year disciplinary infraction have 4% lower odds of participating in SES. As high school students advance by 1 year, they have approximately 19% lower odds of participating in SES.

Comparing the longitudinal findings with the 2006–2007 and 2007–2008 cohorts, I do not find as clear a pattern of correlation (because of time-invariant student factors) as with the elementary and middle school students. The results for high school students appear to be rather sensitive across the two cohort years in terms of size and statistical significance of the coefficients of interest (GPA, disciplinary infractions, and school absences). However, the longitudinal findings tell a similar story to what was found with the elementary and middle school results; namely, high school students who are lower achieving and have better noncognitive performance (fewer school absences and disciplinary infractions in the prior school year) are more likely to participate in SES.

In terms of the decomposition of variance across the three levels for high school students, approximately 71% of the total variation is within students across cohort years, while approximately 4% of the total variation is between students within the same school. As such, the balance of the total variation in the probability of participating in SES, approximately 25%, is between schools. Compared with elementary and middle school students, the share of variance attributable within students is very similar.[24] However, high school students within the same school are much more similar in their probability of participating in SES than elementary or middle school students, indicating that peer influences may play a significant role in the SES choice process among high school students. However, the within-school results may also be driven by the very low take-up rates among high school students, as high school students are far less likely, on average, to participate in SES than their elementary and middle school counterparts in Chicago.

## Discussion

In this article, I have provided a rigorous assessment of SES participation in CPS between the 2004–2005 and 2007–2008 academic years. Originally conceived as a congressional compromise between conservative and liberal lawmakers, the SES policy was introduced by House Republicans into the NCLB legislation to avoid losing all educational choice options during the 2001 reauthorization of the Elementary and Secondary Education Act.[25] To explore the demand-side factors influencing SES participation in this new educational choice option, I used both two- and three-level hierarchical generalized linear models using adaptive centering with random effects to control for school fixed effects (in the cohort models) along with student fixed effects (in the longitudinal analysis). Key among the findings is the relationship between

SES participation and a student's prior-year cognitive achievement and noncognitive performance. For elementary and middle school students in Grades 1 to 8, I find that prior-year cognitive achievement and disciplinary infractions are significant predictors of SES participation in the subsequent school year. The magnitude of the cognitive achievement effect among middle school students is larger than the effect on elementary school students, while student disciplinary infractions have a larger (negative) effect on the probability of participating in SES for middle school students. For high school students in Grades 9 to 12, prior cognitive achievement is also significantly related to SES participation, and the magnitude of the relationship is more similar to what I find for elementary than middle school students. Both prior-year disciplinary infractions and school absences are significantly related to SES participation for high school students. In sum, elementary and middle school students with lower prior-year cognitive achievement and fewer prior-year disciplinary infractions were more likely to participate in SES; high school students with lower prior cognitive achievement and fewer prior-year disciplinary infractions and absences were more likely to participate in SES.

This work contributes to the emerging evidence on the characteristics of students attending perennially underachieving U.S. public schools who receive publicly funded tutoring under the SES provision. Early evidence on SES participation (from a sample of nine large urban school districts for the 2004–2005 school year) suggested that SES participants had lower prior-year reading and math achievement than SES-eligible nonparticipants (Gill et al., 2008). I also find that lower achieving students are more likely to participate in SES in the subsequent school year. Similar to these findings from Chicago on the relationship between noncognitive measures of student performance and SES participation for high school students, recent evidence from Milwaukee finds that students in Grades 9 to 12 with fewer prior-year school absences are more likely to use SES in the subsequent school year (Heinrich et al., 2010). However, while the Milwaukee study does not find that prior-year academic achievement (measured using GPA) is related to SES participation (among a sample of middle and high school students in Grades 6–12), the results herein indicate that students across all grade levels with lower prior-year achievement were more likely to use SES during the subsequent school year.

What do these findings suggest about the SES policy and imply about other education policies that reallocate resources to low-income students via educational choice? Because evidence from Chicago suggests that lower achieving students are more likely to use SES, policies such as voluntary tutoring may help reduce the achievement gap within (and between) schools, to the extent that participating students realize a positive educational benefit to their participation. However, one must be cautious in concluding that such benefits would in fact be realized, given that the evidence on SES effectiveness (both in Chicago and nationally) is inconclusive at best. Moreover, the nature of SES funding requires consideration of not only the impact SES participation has on student outcomes but also whether programs formerly funded by the Title I money now reallocated to SES provided a greater net, or overall, educational benefit relative to SES. Such an assessment of the relative value of SES requires a more comprehensive assessment of SES and the programs it has replaced to determine whether SES increases (or decreases) overall student achievement and school welfare. In addition, evidence that students with lower noncognitive outcomes (e.g., behavior and attendance) are less likely to use SES has direct implications for the role that school personnel (teachers and administrators) and SES providers play in recruiting eligible students. Although SES is predicated on family choice, the evidence presented herein suggests that schools might increase the net benefits of SES by indentifying students with lower prior-year attendance, for example, and work with their families to encourage SES participation. This, coupled with more active and direct communication between SES providers and families, might enhance the efficiency of SES by encouraging students who can potentially realize the greatest gains from additional tutoring and instruction to participate in SES.

As is common in empirical research, this study is constrained by some limitations. First, there is not a full set of data for all variables. For example, although I use measures of how high

school students perceive their school environment, I am unable to similarly model the role of school environment for elementary school students. Second, data on teacher characteristics would allow me to model the teacher's influence on the SES choice process and the extent to which teachers shape the SES choice decision. Empirically, data on teachers would allow me to nest students within teachers and teachers within schools to account for not only within-school and within-student variation but also whether students within teachers (e.g., classrooms) vary in their propensity to participate in SES. Finally, data on supply-side characteristics should be incorporated into future studies of SES participation. In particular, data on SES tutoring providers, such as the curricula used, the credentials and educational characteristics of tutors, as well as other salient features of SES provider program design (e.g., student/tutor ratio) could help researchers and policy makers better understand the role of a student's experience in supplemental learning and instruction to more accurately assess the likelihood of future participation as well as the efficacy of the policy intervention.

This analysis, therefore, provides both a methodological and empirical foundation from which to inform future studies of SES participation. Given the growing imperative for high-quality educational programs for students eligible for services such as SES, including the most disadvantaged among the population, more work needs to be done to understand the factors that are related to participation in additional academic services. This information should be used to better provide services to students with the goal of enhancing both academic achievement and the schooling experience for our nation's neediest students.

## Notes

1. During the 1999–2000 school year, approximately 350,000 U.S. public school students attended charter schools (representing 0.7% of all U.S. public school students). By 2008–2009, approximately 1.4 million students attended charter schools (representing 2.9% of all U.S. public school students; National Alliance for Public Charter Schools, 2009).

2. Funding for SES is drawn directly from district Title I budgets. A local education agency with at least one school required to offer SES must reserve a minimum of 20% of its Title I, Part A allocation, either by reserving 20% of total district Title I funds prior to making allocations to schools or by adjusting Title I allocations to schools to set aside the required funding. Significant heterogeneity in per pupil funding for SES exists both across and within states as well as across districts, which may account for differential rates of SES participation at the national and state levels. For example, across school districts in Illinois during the 2008–2009 school year, the maximum per pupil expenditure for SES ranged from approximately $720 to $3,330 (U.S. Department of Education, 2009a).

3. For a detailed description of the institutional design, policy assumptions, and political economy of the SES provision, see Burch (2006); Burch, Steinberg, and Donovan (2007); and Vergari (2007).

4. A growing research base explores the impact of SES participation on student achievement (particularly standardized test scores); across cities and school districts, evidence on the effectiveness of SES is mixed (see Heinrich, Meyer, & Whitten, 2010, for a review of SES effectiveness studies). In Chicago, there have been three evaluations of SES effectiveness (Chicago Public Schools, 2007a, 2007b; Ryan & Fatani, 2005). Ryan and Fatani (2005) analyzed the achievement impact of SES participation in 2004–2005, while Chicago Public Schools (2007a, 2007b) estimated the effect of SES participation on student achievement for participants in the 2005–2006 and 2006–2007 school years, respectively. Each of the three Chicago evaluations used different methodological approaches to estimating the impact of SES. SES participants in 2004–2005 had larger math and reading test score gains than nonparticipants; SES participants in 2005–2006 realized a small but statistically significant improvement in reading achievement (but no significant improvement in math achievement) compared with SES-eligible students who did not participate in SES. The most recent evaluation (Chicago Public Schools, 2007b) of SES in Chicago found a 5 percentage point increase in reading and a 13.2 percentage point increase in math (on the Illinois Standards Achievement Test) associated with participation in SES; the 5 percentage point increase in reading scale points translates into an increase of 0.03 standard deviations, and the 13.2 percentage point increase in math scale points translates into an increase of 0.12 standard deviations better than expected performance.

5. The only other study that I am aware of that explicitly modeled the factors related to SES participation is that of Heinrich et al. (2010), who examined SES in the context of Milwaukee Public Schools.

6. I use the term *family* to describe the decision-making unit with respect to selecting into participating in SES. However, it is likely that parents of elementary

school students (Grades 1–5) are the primary decision makers, whereas high school students may decide whether or not to participate in SES irrespective of their parents' preferences. As such, in the empirical analysis, I model the SES participation decision separately for students in the elementary (Grades 1–5), middle (Grades 6–8), and high (Grades 9–12) school grades to account for the possibility that the decision-making unit (families, parents, students) differs across school levels.

7. For the purposes of SES eligibility, a "low-income" student receives either free or reduced-price lunch under the National School Lunch Program. For further information on SES eligibility, see U.S. Department of Education (2009b).

8. SES providers may take the form of public- or private-sector organizations that are approved by the state education agency, such as public schools, charter schools, local education agencies, educational service agencies, and faith-based organizations. Private-sector providers may either be nonprofit or for-profit entities. Services include tutoring, remediation, and other academic instruction.

9. The dependent variable provides information about the extensive margin of SES participation; that is, whether an SES-eligible student participated in at least one SES tutoring session. Data on the intensive margin (e.g., the number of hours of tutoring a student received in a given school year) are unavailable.

10. This variable is included as a proxy for family income, given that a continuous measure of family income is not available. The SES provision requires that only low-income students (e.g., those receiving free or reduced-price lunch) are SES eligible.

11. A student classified as never bilingual has never been enrolled in a bilingual classroom and never classified as limited English proficient. A formerly bilingual student was previously classified as limited English proficient, and currently bilingual students were classified as limited English proficient in the specified school year. Data on students' English proficiency status are available for the 2005–2006 school year; data on students' lunch status are available for the 2005–2006 and 2007–2008 school years.

12. Beginning in the 2002–2003 school year, the ISAT became the high-stakes test in Illinois (e.g., test scores on the ISAT were used to determine whether a school met proficiency benchmarks necessary for making AYP). However, only students in Grades 3, 5, and 8 took the ISAT for AYP purposes prior to the 2005–2006 school year.

13. Data on absences during the 2006–2007 school year are available for only the spring semester.

14. From the CPS policy manual *Student Code of Conduct for the Chicago Public Schools for the 2007–2008 School Year*, the severity of disciplinary infractions is as follows: (a) Level 1, inappropriate student behaviors in the classroom or on school grounds; (b) Level 2, student behaviors that disrupt the orderly educational process in the school or on the school grounds; (c) Level 3, student behaviors that seriously disrupt the orderly educational process of CPS; (d) Level 4, student behaviors that very seriously disrupt the orderly educational process of CPS; (e) Level 5, student behaviors that most seriously disrupt the orderly educational process of CPS; and (f) Level 6, illegal student behaviors that most seriously disrupt the orderly educational process of CPS. See the CPS policy manual (Chicago Public Schools, 2010) for detailed descriptions of the types of infractions and behaviors included in each level of misconduct.

15. Only the PSAE reading score for the 2005–2006 cohort was not statistically different between SES participants and nonparticipants.

16. The intraclass correlation indicates how closely correlated two students are within a given school. For example, if $\rho = 1$, every student within a given school would have the same conditional probability of participating in SES, and all of the variability in the conditional probability would be between schools. If, however, $\rho = 0$, then all the variability in the conditional probability of participating in SES would reside within schools. Formally, $\rho$ = (between-school variability/total variability) = $[\tau_{00}/(\tau_{00} + \sigma^2)]$, where $\tau_{00}$ is the variation in the random effect $\mu_{0j}$ and $\sigma^2$ (a parameter to be estimated) is the Level 1 variation. In the case of nonlinear models with binary outcomes, the Level 1 variance is heteroskedastic. In this case, SES participation is a Bernoulli random variable, and the Level 1 variance will be $\mu_{ij}(1 - \mu_{ij})$, where $\mu_{ij}$ is the predicted probability of participating in SES for student $i$ in school $j$, on the basis of the Level 1 structural model. However, Raudenbush and Bryk (2002) described an alternative conception of the intraclass correlation coefficient for models with binary outcomes exists. Under this model, I calculate $\rho$ in the following way: $\rho$ = (between-school variability/total variability) = $\{\tau_{00}/[\tau_{00} + (\pi^2/3)]\}$, where $\tau_{00}$ is the variation in the random effect $\mu_{0j}$ and $(\pi^2/3)$ is the Level 1 variation (where $\pi$ is a constant value).

17. All cohort models (except for 2004–2005) condition on prior-year SES participation. As a result, the relationship between prior achievement levels and current SES participation status may reflect both the efficacy of prior-year SES participation (e.g., the potential benefit or impact of participating in SES in the prior year on a student's achievement level) as well as the student's idiosyncratic need for additional academic instruction.

18. Because the cohort models include different sets of covariates (because of data availability), the

intraclass correlation coefficients should not be considered comparable.

19. In alternative specifications of the longitudinal model for high school students, I included the four survey measures from the Student Connection Survey. Recall that only high school students had prior-year responses to the survey for the 2006–2007 and 2007–2008 cohort years. Inclusion of the school environment measures did not substantively affect the interpretation of the key parameters of interest. Of note, however, is that the odds ratio on a student's prior-year cumulative GPA decreased (from 0.8869 to 0.8279) with the inclusion of the survey measures, reflecting the fact that higher achieving high school students were more likely to participate in the school survey while still having lower odds of participating in SES. Results from this model are available on request.

20. The proportion of variance within students in the probability of participating in SES may be calculated as

$$\frac{\frac{\pi^2}{3}}{\left(\frac{\pi^2}{3} + \tau_{\beta_{0ij}} + \tau_{\gamma_{00j}}\right)}.$$

To calculate the proportion of variance between students within schools, I replace the numerator, $\frac{\pi^2}{3}$, with the Level 2 variance, $\tau_{\beta_{0ij}}$. Similarly, to calculate the proportion of variance between schools, I replace the numerator this time with the Level 3 variance, $\tau_{\gamma_{00j}}$ (Raudenbush & Bryk, 2002).

21. The key parameters of interest from Table 8 are $\theta_{010}$, $\theta_{020}$, $\theta_{030}$, and $\theta_{040}$.

22. Results from the cohort models capture the relationship between prior achievement levels (net of prior-year SES participation in all cohorts except 2004–2005) and current SES participation status. Results from the longitudinal models relate changes (or growth) in cognitive (achievement) and noncognitive student characteristics to changes in SES participation status between 2006–2007 and 2007–2008. Although evidence from both models indicates that lower achieving students are more likely to participate in SES, all comparisons between the cohort and longitudinal models are made with this important caveat in mind.

23. An important caveat when comparing the longitudinal results with the cohort models is that the 2007–2008 cohort model for middle school students included controls for the school environment, as measured by the Student Connection Survey. As such, the more relevant comparison with the longitudinal findings is likely the 2006–2007 cohort results, which do not include controls for the survey measures of school environment.

24. The Level 1 (within-student) variance is a result of how the intraclass correlation is conceived for binomial models. Because the probability of SES participation is conceptualized in terms of a latent index model with a logit link function, the Level 1 random effect is therefore assumed to have a standard logistic distribution with a mean of zero and variance $\frac{\pi^2}{3}$. On the basis of fully unconditional longitudinal models (available on request), the within-student variance does not differ much from models conditioning on time-varying student measures. This large within-student variance implies that there is significant year-to-year variation within a student in SES participation. For the 2006–2007 and 2007–2008 school years, only 9% of students eligible for SES in both years participated in SES in both years (see Table 2). The low take-up rate across years in Chicago is consistent with findings from a study of SES in the Los Angeles Unified School District, which explored SES participation over time and found low rates of multiyear SES participation (Rickles, Barnhart, & Gualpa, 2008).

25. According to Peterson (2005), conservative lawmakers viewed private school vouchers for students attending perennially underachieving public schools as their favored accountability policy, whereas liberal lawmakers were adamantly opposed to anything that resembled a private school voucher. The SES policy was viewed as a political compromise between voucher supporters on the right and voucher opponents on the left.

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