The Implementation and Effectiveness of Supplemental Education Services in Milwaukee Public Schools

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Background

- No Child Left Behind (NCLB) Act mandates supplemental educational services (SES) provision for disadvantaged students as a “consequence” or “corrective action” for schools failing to make adequate yearly progress (approx. $2.5 billion in funding per year)
  - Public and/or private (non-profit or for-profit) organizations contracted to provide tutoring in reading and mathematics (outside regular school day)

Research motivation

- State/local educational agencies are required to assess SES provider effectiveness and withdraw approval from providers that fail to increase student academic achievement
  - NCLB intends to “empower” parents with information and choice in SES
    - Yet states and school districts have limited capacity for evaluating SES provider effectiveness
    - School districts frequently rely on vendor self-reports of effectiveness

Research questions

- Milwaukee Public Schools (MPS) account for vast majority of public schools identified for improvement (SIFI) in Wisconsin—81% on average, 2002-2007
- Primary research questions in MPS SES study:
  - Who among eligible students signs up for SES?
  - With the available information, can MPS identify SES effects and provider effectiveness in increasing student achievement?
  - What SES practices or approaches appear to contribute more (or less) to students' learning?

Study components

- Focus groups to explore parent/child SES choices and students' SES activities and experiences (August 2006)
- Student surveys to collect data on participation in SES and experiences with SES vendors (spring of 2007)
- Statistical analyses of factors influencing student choices to sign up for and attend SES (2004-05, 2005-06 and 2006-07)
- Econometric estimation of SES effects on student reading and math achievement gains (2004-05, 2005-06, 2006-07)
- In-depth qualitative study of SES vendors' practices

Findings of prior SES research

- Descriptive and exploratory research on challenges of implementing SES in evolving markets w/asymmetric information on demand and supply sides
  - Large national providers dominate market; widely varying hourly charges
  - Lack of independent information on tutor qualifications, content and instructional strategies, cost structures
  - Low student enrollment and attendance; inadequate monitoring and oversight

Empirical research on SES

- Empirical studies reported mixed, mostly limited effects of SES:
  - Among students receiving at least 40 hours of tutoring
  - In case of skills tests aligned with SES curriculum
  - Primarily among elementary school students
- Studies limited in controlling for student selection or measuring actual student attendance/instruction time

Participation in SES

- SES take-up among eligible students low nationwide
  - NCLB requires districts to “promote maximum participation by providers,” give parents “as many choices as possible” and to notify parents of SES availability and allow them to select “any approved provider” *[Section 1116(e)(4)]*
- Multiple stages of student/parent selection into SES: eligibility/awareness, registration, attendance
  - Not all parents receive or understand information on SES; students respond to incentives in signing up

Student SES eligibility, registration and attendance in MPS

Academic Year	Eligible (Middle and High School)	Number Registered (% of eligible)	Number Attended (% of registered)
2003-2004	6508	3707 (57%)	3333 (90%)
2004-2005	9433	3826 (41%)	2610 (68%)
2005-2006	7351	3996 (54%)	2543 (64%)
2006-2007	8119	3897 (48%)	1315 (34%)

Who signs up for SES?

- Probability of registering for SES and attending at least one SES session (*conditional on registration*)
  - More likely to register: females*, free-lunch eligible, attended SES prior year*
  - Less likely to register: Asians, whites, Hispanics, those w/greater number of regular school absences*
  - More likely to *attend*: Hispanics, ESL students
  - Less likely to *attend*: H.S. free-lunch eligible and retained students

**Observed relationship is same for registration and attendance*

SES effects on math and reading achievement gains

- Propensity score matching methods used to account for *observed* student selection into SES
  - Effects of *any* SES attendance on student achievement and effects of total hours attended:
    - 20 or more hrs. vs. 0 hrs. attended, 40 or more hrs. vs. 0 hrs attend
    - Among attendees: <10 hrs. vs. 10+ hrs., <20 hrs. vs. 20+ hrs., <30 hrs. vs. 30+ hrs., <40 hrs. vs. 40+ hrs.
- Fixed-effects “double difference” estimation of effects of any SES participation in middle/high school cohorts
- Ordinary least squares methods to examine effects of specific SES providers

Effects of attending any SES, 2004-05, 2005-06 and 2006-07 school years

(Standard errors in parentheses; results statistically significant at $\alpha \leq 0.05$ shown in bold)

Treatment measure and method	Middle School		High School	
	Change in math test scores	**Change in reading test scores**	**Change in math test scores**	**Change in reading test scores**
2004-05 school year				
Attended any SES 1. unmatched 2. matching	 -2.486 (4.562) 2.024 (5.557)	 -3.368 (5.232) 3.038 (5.916)	 -10.486 (6.243) -5.427 (8.107)	 **-14.420 (7.139)** -4.565 (8.860)
Number of observations	N=1562	N=1571	N=1224	N=1262
2005-06 school year				
Attended any SES 1. unmatched 2. matching	 -0.529 (0.413) -0.232 (0.427)	 0.708 (1.202) 0.323 (1.099)	 0.235 (0.297) -0.372 (0.357)	 **2.846 (1.132)** 1.397 (1.099)
Number of observations	N=1075	N=1016	N=2215	N=2200
2006-07 school year				
Attended any SES 1. unmatched 2. matching	 -0.112 (3.993) 0.595 (4.343)	 5.798 (4.566) 4.022 (5.771)	n.a.	n.a.
Number of observations	N=462	N=464	Only 10th graders were tested (N=80), and only 7 of them registered for SES	

Effects of total hours attended SES
2004-05, 2005-06 and 2006-07 school years

(Standard errors in parentheses; results statistically significant at $\alpha \leq 0.05$ shown in bold)

Treatment measure and method	Middle School		High School	
	Change in math test scores	Change in reading test scores	Change in math test scores	Change in reading test scores
2004-05 school year				
1. # SES hours attended (OLS)	0.046 (0.068) n=1562	-0.017 (0.068) n=1571	-0.127 (0.158) n=1224	-0.148 (0.178) n=1262
SES hours attended (matching)				
2. at least 20 hours (vs. none)	7.727 (5.921) n=1419	5.256 (6.493) n=1428	-24.240 (14.367) n=202	-7.191 (16.262) n=207
3. at least 40 hours (vs. none)	12.757 (7.774) n=1273	11.648 (8.790) n=1282	-26.676 (14.662) n=140	-24.679 (19.241) n=145
If attended > 0 hours:				
4. >10 hours (vs. less<10)	19.503 (16.384) n=427	3.603 (14.744) n=427	-1.840 (14.626) n=185	2.051 (18.510) n=190
5. >20 hours (vs. less<20)	**23.093 (10.201)** n=431	16.596 (13.442) n=431	5.888 (13.426) n=185	6.050 (16.675) n=190
6. >30 hours (vs. less<30)	-4.609 (11.218) n=431	-5.598 (12.868) n=431	5.307 (12.387) n=183	-0.450 (14.424) n=188
7. >40 hours (vs. less<40)	0.156 (11.992) n=416	-3.913 (11.982) n=416	2.689 (12.123) n=183	-14.796 (15.035) n=188
2005-06 school year				
1. # SES hours attended (OLS)	-0.005 (0.013) n=1075	-0.010 (0.040) n=1016	0.007 (0.011) n=2215	**0.087 (0.042)** n=2200
SES hours attended (matching)				
2. at least 20 hours (vs. none)	-0.055 (0.441) n=366	0.117 (1.672) n=343	0.246 (0.504) n=626	0.328 (1.992) n=595
3. at least 40 hours (vs. none)	0.175 (0.814) n=216	0.547 (2.694) n=200	-1.832 (1.094) n=346	-5.220 (3.546) n=333
If attended > 0 hours:				
4. >10 hours (vs. less<10)	1.226 (0.672) n=304	0.721 (3.523) n=282	1.008 (0.556) n=505	2.722 (3.364) n=468
5. >20 hours (vs. less<20)	-0.697 (0.656) n=304	-0.762 (2.211) n=282	1.402 (0.715) n=508	0.519 (2.295) n=482
6. >30 hours (vs. less<30)	1.086 (0.845) n=307	-2.694 (2.307) n=285	0.787 (0.593) n=505	-1.419 (1.947) n=468
7. >40 hours (vs. less<40)	0.403 (0.705) n=293	0.479 (2.284) n=271	-1.116 (0.872) n=470	-4.534 (3.350) n=421
2006-07 school year				
1. # SES hours attended (OLS)	0.023 (0.190) n=462	-0.045 (0.222) n=464	n.a.	n.a.
SES hours attended (matching)				
2. at least 20 hours (vs. none)	0.310 (7.381) n=370	-4.178 (6.356) n=379		
3. at least 40 hours (vs. none)	-11.199 (22. 639) n=285	-5.820 (11.812) n=289	n.a.	n.a.
If attended > 0 hours:				
4. >10 hours (vs. less<10)	2.359 (8.719) n=462	-6.606 (6.876) n=463		
5. >20 hours (vs. less<20)	-2.501 (7.072) n=462	-5.539 (6.893) n=463		
6. >30 hours (vs. less<30)	0.991 (12.573) n=462	-4.974 (9.849) n=464		
7. >40 hours (vs. less<40)	0.032 (35.163) n=462	10.368 (22.727) n=464		

Fixed Effects Estimates of the Effect of SES in 8th and 9th Grades, 2004-2006

	Achievement grade 9 – 8	Achievement grade 10 – 9	Fixed Effects (Double-difference)
Reading			
SES 8th Grade	-1.58		-2.35
(standard error)	(2.31)		(3.38)
SES 9th Grade		0.33	0.27
(standard error)		(2.03)	(3.41)
Sample Size: 4300			
Math			
SES 8th Grade	-2.67		-5.91
(standard error)	(2.32)		(3.53)
SES 9th Grade		-0.47	-4.13
(standard error)		(2.25)	(3.59)
Sample Size: 4228			

Pooled Fixed Effects Model Results for Middle School Cohorts, 2005-2007

	Reading				Math		
Grade Cohort	Estimate	Standard Error	Sample Size		Estimate	Standard Error	Sample Size
5 & 6	5.10	(7.93)	4679		-1.12	(6.64)	4680
6 & 7	-1.02	(4.38)	4892		-0.47	(3.89)	4883
7 & 8	-1.80	(4.99)	3848		-5.66	(4.40)	3864
All Middle School Grades	-0.41	(2.19)			-2.49	(1.94)	

Findings of analysis of SES provider performance

- Six providers produced statistically significant gains in students' math and/or reading achievement in 2004-05 and/or 2005-06
  - No one provider appreciably more effective than others; effects small relative to variability of gains in student test scores
- Information on providers shows few consistent attributes or logical relationships among them
- MPS student reports in spring 2007 surveys: less than 30% said SES had been helpful in improving their academic performance

Characteristics of SES Providers Identified as Effective in Increasing Student Test Scores

Provider characteristics 2004-05 school year	Vendor A	Vendor B	Vendor C	Vendor D	Vendor E	Vendor F
Legal status	Nonprofit	Nonprofit	Nonprofit	For-profit	For-profit	For-profit
Hourly rate charged*	$80	$40	$40	$40	$65	$63
Reported student-teacher ratio	5:1	n.a.	5:1	7:1	10:1	3:1
# of sessions offered	19-23	64	21	46	23	n.a. (at home, on-line)
% of registered students attending any hours (and rank among providers)	44.6 (20)	75.2 (4)	70.0 (8)	43.7 (21)	72.6 (7)	64.8 (11)
% of students attending 20 or more hours (and rank among providers)	33.9 (16)	40.3 (12)	44.4 (9)	17.2 (21)	30.1 (18)	29.3 (19)
Share of registered students	1.5	3.4	2.4	2.3	12.7	7.2

* Hourly rates charged by approved providers in Milwaukee in 2005 ranged from $20 per hour to $100 per hour.

Relationship of provider effectiveness to market share

- Are market shares of more effective MPS providers larger and/or increasing over time?
  - Nonprofit, locally-based providers exited the market or had no registered students
  - In 2007-08, only the two national providers were still offering SES
  - Vendors—large or small, local or national—w/smallest or no market share most likely to exit
  - Top 5 providers had approx. 70% of total market share over study period

In-depth qualitative study

- Need to better understand why SES programs not more effective
  - Concerns: Issues of access, quality of curriculum and instruction, student engagement and intensity of programming
- Approach: In-depth classroom observation data; interviews with tutors, administrators, district staff
- Goal: Inform changes in policy and market governance to improve program quality and address equity issues

Challenges in registering eligible students and increasing attendance

- Parents receive little quality information on SES goals and quality of tutoring
- Disparities in parent/student goals and intent of the policy, i.e., help getting grades up and improving attitude towards school versus improving test scores in math and reading
- Curriculum and instruction insufficient to meet specific needs of all ELL and special education students
  - Potential barriers to access (few providers have bilingual staff or special education trained staff)
- “Competition” for students’ after school time from sports, other after school programs and employment

Why no *average* impacts of SES on student math and reading gains?

- Fragmentation: SES *curriculum* directly connected to students' regular school day curriculum *only* when tutors happen to also work at school
- Limited innovation: SES *instruction* typically "more school", often literally, in form of homework help
- Intra-provider variation: In-use curriculum often supplemented by tutor and sometimes inconsistent with formal curriculum

Why no clear patterns of marginal effects of SES hours attended?

- Providers determine tutoring schedule (frequency and length of sessions) based on costs (e.g., facility use) and maximizing attendance/revenue
- Hours attended may not capture range in intensity of programming
  - Students leave tutoring early, sometimes to attend other programs in the school
  - Actual time spent on instruction differs greatly
- Variation in intensity of interaction between tutor and student (e.g., one-to-one teacher led activities vs. individual student work in large groups)

Why no clear patterns among characteristics of vendors with small effects?

- Tutoring staff varied in education, experience and training; some provider administrators without a background in education
- Policy and organizational barriers to quality improvement
- Great variation of curricula and instruction observed *within* providers, leading to inconsistent effects

Implications for policy and future research

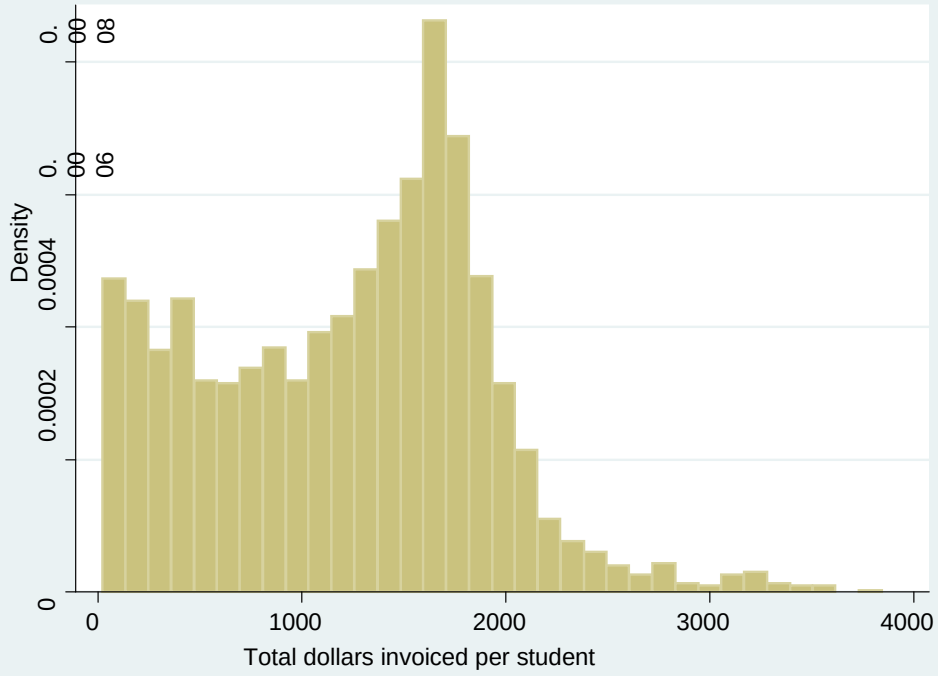
- Can we determine where/how quality is being compromised (e.g., scheduling/duration of sessions) and how it can be improved?
- What organizational features matter most for effectiveness?
- To what extent are effects explained by intra- (vs. inter-) provider variation?
- How can public policy be directed to minimize inequities, expand promising programs, eliminate barriers to students continuous participation, and improve provider accountability?

Example: Improving SES provider accountability

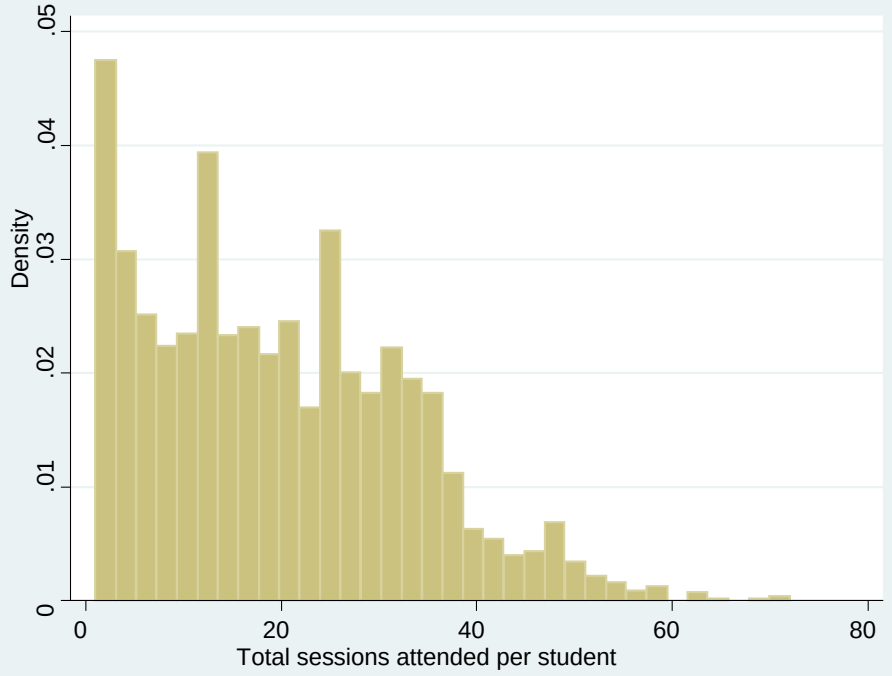
- Lack of relationship between SES hours attended by students and invoice totals (and hours attended and provider performance in increasing student achievement) in MPS
  - *Total invoiced* by providers is simple function of *total number of sessions* attended—two distributions should be very similar in shape
  - MPS instituted new procedures over time for verifying student hours attended

Relationship of SES invoice totals to total SES sessions attended (per student), 2004-05

Distribution of SES invoice totals

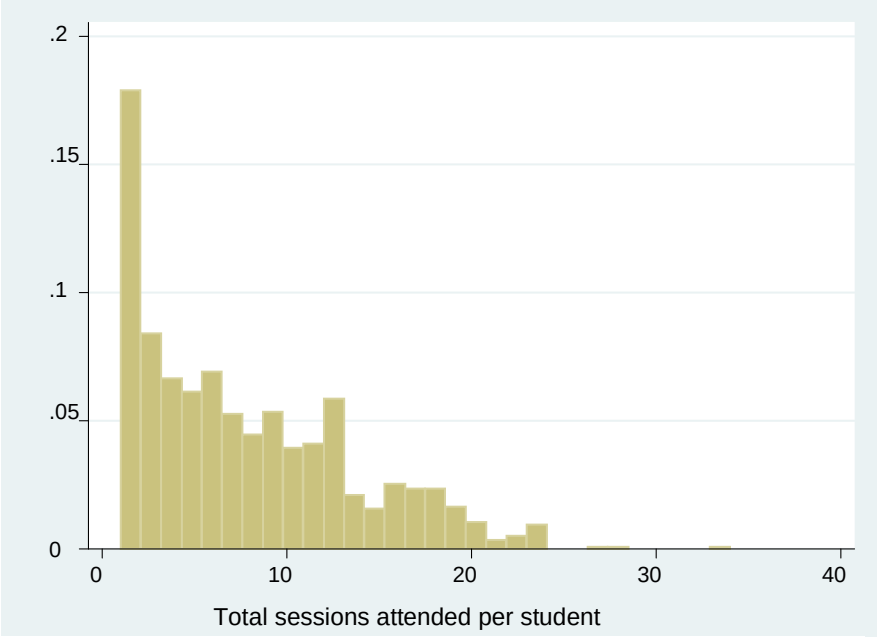


Distribution of total SES sessions attended



Relationship of SES invoice totals to total SES sessions attended (per student), 2006-07

Distribution of total SES sessions attended



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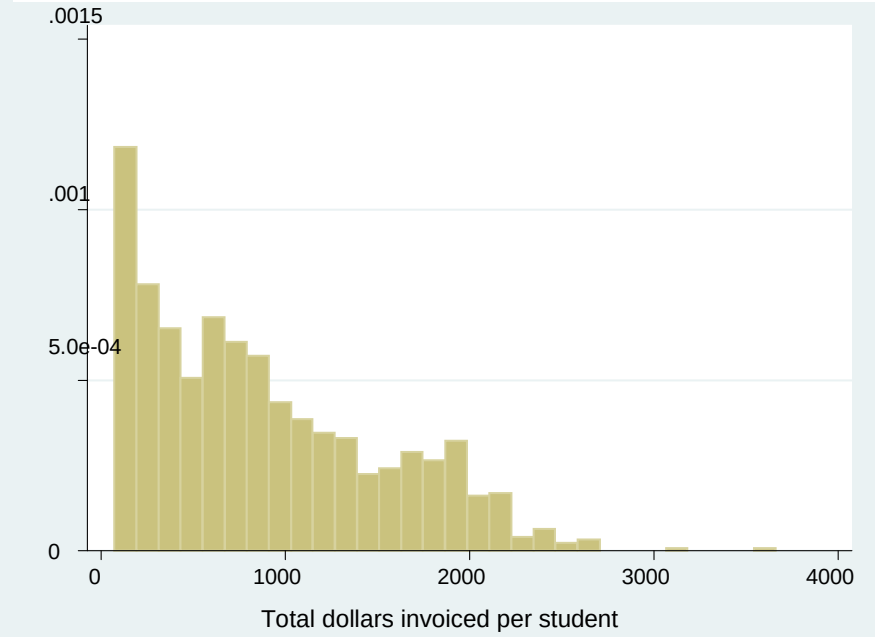

Study limitations

- Qualitative data based on limited sample of vendors
- Complete test data on student achievement not available each school year
  - More disadvantaged students less likely to take reading and math achievement tests
- We may not be adequately controlling for student selection into SES registration and attendance
- Measures of effects limited to standardized tests