

# The Aggregate Effects of School Choice: Evidence from a Two-Stage Experiment

**Karthik Muralidharan (UC San Diego, NBER, and J-PAL)**

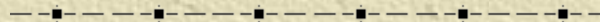
with

Michael Kremer, Harvard

Venkatesh Sundararaman, World Bank

**IGC-ISI Development Policy Conference, Delhi**

**20 December 2011**



# Background

- ✦ India has achieved near universal primary school enrollment.
  - ◆ ~96% enrollment in among children aged 6-14 (Pratham, 2010).
  
- ✦ But learning levels are low
  - ◆ 92% of 1<sup>st</sup> grade students cannot read at grade level
  - ◆ 31% cannot even recognize letters accurately
  - ◆ 60% of children aged 6-14 cannot read at 2<sup>nd</sup> grade level (Pratham 2010)
  
- ✦ Severe accountability problems in the public school education system.
  - ◆ 25% teachers in public schools were absent during unannounced visits, and less than half of them were actually in the classroom teaching (Kremer et al, 2005).
  
- ✦ Sharp increase in the number of fee-charging private schools over the past decade
  - ◆ Over 20% of rural children and over 50% of urban children aged 6-14 attend private schools (Desai et al. 2009)
  - ◆ Drivers include demand for English, and public school failure

# Summary Statistics on Public & Private Schools (in our sample)

	Private Schools (1)	Government Schools (2)	(1)-(2)	P-value of (1)- (2)
Normalized Baseline Telugu Score	<b>0.65</b>	-0.03	0.68	0.00
Normalized Baseline Math Score	<b>0.67</b>	-0.01	0.68	0.00
Both parents have completed primary school	<b>0.58</b>	0.27	0.31	0.00
At least one parent has completed grade 10	<b>0.56</b>	0.34	0.22	0.00
Scheduled Caste	0.14	<b>0.33</b>	-0.19	0.00
Household Asset Index	<b>3.85</b>	3.20	0.65	0.00
Annual Fees	<b>1330.37</b>	3.79	1326.57	0.00
Total annual spending	1462.66	<b>7,679.71</b>	-6217.05	0.00

# Motivation

- ✦ Existing studies in India find significantly higher test scores in private schools even after controlling for HH assets/literacy
  - ◆ Muralidharan & Kremer (2008)
  - ◆ Desai, Dubey, Vanneman, & Banerjee (2009)
  - ◆ But confounded by omitted variables and selection issues
  
- ✦ Theory (and cross sectional data) suggest a strong case for considering voucher-based education reforms that fund students and not schools – increasing choice and competition
  - ◆ Ethical as well as efficiency reasons to consider this
  - ◆ Concerns about social stratification (limited ‘voice’ as well as ‘exit’ options for poor)
  
- ✦ The recent Right to Education Act includes a provision mandating that private schools reserve up to 25% of the seats in their school for students from disadvantaged backgrounds
  
- ✦ No evidence on what the impact of such a provision may be!

# This Paper

- ✦ Presents results from the first school-choice experiment in India (designed to mimic key provisions of the RtE Act)
- ✦ Experiment conducted across 180 villages in the state of Andhra Pradesh
- ✦ Randomly selected communities and students are provided with vouchers/scholarships to move to a private school of their choice (typically within the same village)
- ✦ Key design feature is the ability to:
  - ◆ Compare the impact of receiving the scholarship relative to a “pure” control that is uncontaminated by students leaving for private schools
  - ◆ Study the impact of the program on (a) students left behind in the public schools, and (b) students starting out in the private schools to begin with



✦ Experimental Design & Validity

✦ Results - Process

✦ Results – Test Scores

# Experimental Design

## Typical Experimental Design for School Choice Studies

### Group 1

Non-Applicants in  
Public Schools

### Group 2

Applicants in  
Public Schools  
NOT awarded a  
Voucher

### Group 3

Applicants in  
Public Schools  
AWARDED a  
Voucher

### Group 4

Non-voucher  
students in  
private schools

# Experimental Design

## Design of the AP School Choice Project

### Treatment Villages

**Group 1T**  
Non-Applicants in  
Public Schools

**Group 2T**  
Applicants in  
Public Schools  
NOT awarded a  
Voucher

**Group 3T**  
Applicants in  
Public Schools  
AWARDED a  
Voucher

**Group 4T**  
Non-voucher  
students in  
private schools

### Control Villages

**Group 1C**  
Non-Applicants in  
Public Schools

**Group 2C**  
Applicants in  
Public Schools  
NOT awarded a  
Voucher

**Group 3C**  
Does not exist

**Group 4C**  
Non-voucher  
students in  
private schools



# Key Features of Scholarship Program

## ✧ Household level

- ◆ Completely voluntary, can always go back to public school
- ◆ No conditions (except answering surveys and taking assessments)
- ◆ Scholarship covered all school fees, books, and uniforms
- ◆ Did not cover transport and mid-day meals
- ◆ Household did not see any cash or physical voucher (payments made directly to schools)

## ✧ School level

- ◆ Completely voluntary as well
- ◆ Fees set by Foundation at the 90<sup>th</sup> percentile of the distribution of private school fees in the sample villages (expected to be above marginal cost for all schools)
  - Pre-specified rate of fee increase for 5 years (based on inflation) with an average annual increase of ~10-12%
- ◆ Schools were asked if they:
  - A) Wanted to participate in the program
  - B) And if so, how many seats they could offer to scholarship students
- ◆ Schools not allowed to cherry pick students – if there was more demand for a particular school than the number of places offered under (B), then those places would be allocated by lottery
- ◆ Fees would be directly paid by the Foundation (including books, and uniforms)
- ◆ No top up fees could be charged (except for the school bus if used)

# Experimental Design: Timeline and Activities

	<p>The AP School Choice Project was implemented by the Azim Premji Foundation (APF) – a leading non-profit organization in India in partnership with the Govt. of AP and the World Bank, and with financial support from the Legatum Institute</p>
Jan - Feb 2008	<p>Identification of ~200 villages across 5 districts with at least 1 private school, and conducting of census of all schools in the identified villages (including Anganwadis - which are government-run pre-school centers)</p>
Mar-Apr 2008	<p>Baseline assessments administered for children in kindergarten and class 1 in all schools in sample villages.</p>
Apr-May 2008	<p>Baseline household socio-economic survey carried out in all villages. Parents of children in government schools asked if they would be interested in applying for a scholarship that would enable their child to attend a private school if offered (hypothetical).</p>
May-08	<p>Proposal to participate in APSC project sent to all private schools in sample villages (basic terms and conditions). Villages without any private school that accepted were dropped.</p>
Jun-08	<p>Sample villages randomly allocated into treatment and control groups. Within treatment villages, a proportion of applicants randomly offered scholarships.</p>
Jun-08	<p>Scholarship recipients (and families) informed of acceptance. 1,980 scholarships offered (out of 6433 applicants), of which 1,210 were accepted. Households that accepted were advised to choose a school by the end of June (school year starts in mid June).</p>
Aug 08 - Apr 10	<p>Ongoing tracking surveys conducted in schools and households to measure process variables</p>
Nov-10	<p>Post-program assessment of learning (roughly 2.5 years into the program)</p>

# Validity of Design

- ✦ Randomization ensures that there is no difference between any of the groups across T & C villages on observables
  - ✦ Baseline test scores
  - ✦ HH affluence/education
- ✦ Main challenge is attrition
- ✦ We try to track every kid who applied for a scholarship, and a representative sample of groups 1 and 4
- ✦ 33% attrition in group 1; 39% in group 4
  - ✦ But no differential attrition
- ✦ 10% attrition in group 3T; 15% attrition in groups 2T and 2C
  - ✦ This difference IS significant
  - ✦ But, no difference on observables
  - ✦ Will do both inverse probability re-weighting and Lee bounds

## Descriptive Results: Teacher Comparisons

Characteristics:	Private School Teachers (1)	Government School Teachers (2)	(1) - (2)	P-value of (1)-(2)
Male	<b>0.22</b>	0.43	-0.21	0.00
Age	27.01	<b>39.61</b>	-12.60	0.00
Years of teaching	4.76	<b>14.53</b>	-9.77	0.00
Number of Schools taught previously	0.78	<b>2.63</b>	-1.85	0.00
Completed at least college or masters	0.61	<b>0.89</b>	-0.28	0.00
Teacher training completed	0.27	<b>0.99</b>	-0.72	0.00
In-service teacher training program attended in the last 6 months	0.01	<b>0.79</b>	-0.77	0.00
Come from the same village	<b>0.46</b>	0.14	0.32	0.00
Current gross salary per month	2,003.32	<b>13,843.32</b>	11,840.00	0.00
Total number of observations	1,641	1,195		

# Descriptive Results: Teacher time use diaries

## Teacher Time Use (minutes) in a Typical Day in Control Villages

Characteristics:	Private School Teachers (1)	Government School Teachers (2)	(1) - (2)	P-value of (1)-(2)
Teaching activity	<b>247.67</b>	218.77	28.90	0.00
Preparing for classes	7.78	7.03	0.75	0.47
Correcting homework	<b>53.47</b>	38.99	14.48	0.00
Maintaining order and discipline	14.40	12.98	1.42	0.29
Administrative/paper work	5.84	<b>17.28</b>	-11.43	0.00
Breaks during school	<b>45.91</b>	40.98	4.93	0.05
Getting children to attend school	1.81	<b>5.77</b>	-3.96	0.00
Mid-day meals	19.71	<b>35.34</b>	-15.63	0.00
Extra classes	<b>9.97</b>	3.93	6.05	0.00
Others	6.33	4.39	1.94	0.14
Total time spent in a given day	<b>412.89</b>	385.44	27.45	0.00
Total number of observations	1,641	1,195		

# Descriptive Results: Teacher and Classroom Activities

## Classroom activity and Teacher Absence in Control Villages

<b>Classroom level Characteristics:</b>	Private School Teachers	Government School Teachers	(1) - (2)	P-value of (1)-(2)
	(1)	(2)		
Class is engaged in active teaching	<b>0.47</b>	0.35	0.12	0.00
A teacher is present in class	<b>0.97</b>	0.93	0.05	0.00
Effective in teaching and maintaining discipline	<b>0.47</b>	0.36	0.11	0.00
Teacher has complete control over class	<b>0.70</b>	0.42	0.28	0.00
Same teacher teaches another class in the same room	0.20	<b>0.79</b>	-0.59	0.00

### Teacher level Characteristics

Cannot find the teacher (absent) before the class starts	0.08	<b>0.27</b>	-0.19	0.00
Teacher is actively teaching	<b>0.44</b>	0.29	0.15	0.00
Teacher is in school and not teaching	0.02	<b>0.06</b>	-0.04	0.00

# Descriptive Results: Student Time Use Diaries

Characteristics	Private Schools (1)	Govt. Schools (2)	(1) - (2)	P-value of (1)-(2)	Applicants offered from treatment (3)	Applicants from control (4)	Intention to Treat Estimate (3)-(4)	P-value of (3)-(4)	Treatment on Treated Estimate (5)	P-Value of (5)
Bathing/Toilet/Getting ready	55.43	64.66	-9.24	0.00	57.64	64.49	-6.84	0.13	-9.37	0.13
Time spent in school	<b>428.84</b>	395.40	33.44	0.00	422.72	398.00	<b>24.73</b>	0.00	<b>33.86</b>	0.00
Studying and doing homework at home	<b>75.79</b>	49.07	26.72	0.00	50.17	49.41	0.76	0.85	1.04	0.85
Private tuition	<b>28.38</b>	17.11	11.27	0.05	15.59	21.91	-6.32	0.38	-8.66	0.37
Watching TV	77.29	78.89	-1.61	0.78	76.38	78.58	-2.21	0.70	-3.02	0.70
Playing with friends	83.12	<b>103.69</b>	-20.57	0.00	104.38	104.28	0.10	0.99	0.14	0.99
At home	827.33	841.72	-14.39	0.16	888.96	847.17	41.79	0.13	-30.39	0.12
Working in the household or on chores	7.95	<b>24.68</b>	-16.73	0.00	11.77	23.47	<b>-11.70</b>	0.08	<b>-16.03</b>	0.08
Caring for children and elderly	6.28	<b>14.66</b>	-8.38	0.01	8.51	16.62	-8.11	0.02	-11.10	0.02

# Descriptive Results: Parental Satisfaction, Aspiration and Perceptions of Their Child's Education

Characteristics	Private	Government	P-value of (1)-(2)	Applicants	Applicants	P-value of (3)-(4)	Treatment	P-Value of (5)
	Schools (1)	Schools (2)		offered from treatment (3)	from control (4)		on Treated Estimate (5)	
Satisfied with quality of child's education	<b>0.92</b>	0.77	0.00	<b>0.86</b>	0.77	0.06	<b>0.13</b>	0.06
Like to see child go to college	0.18	0.17	0.80	0.17	0.15	0.45	0.04	0.45
Aspire to have a child get a formal sector job	<b>0.71</b>	0.60	0.02	0.66	0.57	0.21	0.12	0.21
Quite likely that child will meet the aspiration of getting a formal sector job	<b>0.78</b>	0.60	0.00	0.61	0.59	0.87	0.02	0.87

## Differences between Parental Ratings on Child's Characteristic and Teacher's Effectiveness

High intelligence	0.75	0.50	0.00	0.53	0.49	0.43	0.06	0.43
High discipline	0.76	0.57	0.00	0.62	0.56	0.37	0.07	0.38
High interest in going to school	0.88	0.78	0.00	0.77	0.78	0.86	-0.01	0.86
High interest in doing homework	0.85	0.55	0.00	0.63	0.55	0.16	0.11	0.16
High interest in learning	0.73	0.48	0.00	0.50	0.50	0.94	-0.01	0.94
High interest in maintaining personal hygiene	0.86	0.60	0.00	<b>0.72</b>	0.60	0.05	<b>0.16</b>	0.06

## Differences between Parental Ratings on Teacher's Effectiveness in Improving:

Intelligence/academic ability	0.81	0.60	0.00	<b>0.71</b>	0.59	0.07	<b>0.16</b>	0.07
Discipline	0.80	0.61	0.00	<b>0.73</b>	0.62	0.08	<b>0.15</b>	0.08
Interest in going to school	0.81	0.63	0.00	<b>0.77</b>	0.66	0.06	<b>0.16</b>	0.06
Interest in doing homework	0.85	0.63	0.00	0.71	0.61	0.12	0.13	0.12
Interest in learning	0.80	0.56	0.00	0.63	0.57	0.36	0.09	0.37
Personal hygiene	0.75	0.58	0.00	<b>0.73</b>	0.61	0.07	<b>0.16</b>	0.07



# Children's Views on Schools and Teachers

Characteristics	Private Schools (1)	Government Schools (2)	P-value of (1)-(2)	Applicants offered from treatment (3)	Applicants from control (4)	P-value of (3)-(4)	Treatment on Treated Estimate (5)	P-Value of (5)
<b>Child likes going to school</b>	<b>0.95</b>	<b>0.92</b>	<b>0.08</b>	<b>0.87</b>	<b>0.94</b>	<b>0.07</b>	<b>-0.10</b>	<b>0.06</b>
Teacher checks the child's homework	0.99	0.92	0.00	0.98	0.91	0.01	0.11	0.01
Teacher punishes for not doing homework	0.90	0.79	0.00	0.89	0.78	0.02	0.16	0.02
Teacher has beaten the child in school	0.87	0.77	0.00	0.79	0.74	0.34	0.07	0.33
Teacher beating at least once in the last week	0.66	0.57	0.09	0.57	0.55	0.80	0.03	0.80
Teacher encourages use of workbooks	0.80	0.45	0.00	0.64	0.51	0.04	0.20	0.04
Homework assigned at least once in two days	0.98	0.81	0.00	0.97	0.80	0.00	0.24	0.00
<b>Child uses the school toilet</b>	<b>0.37</b>	<b>0.14</b>	<b>0.00</b>	<b>0.34</b>	<b>0.16</b>	<b>0.00</b>	<b>0.27</b>	<b>0.00</b>

# Test Score Impact (1)

Panel A: Comparing 3T with 2T

	Normalized End line General Score (Y3)	Normalized End line Telugu Score (Y3)	Normalized End line Math Score (Y3)	Normalized End line English Score (Y3)
Offered	0.003 (0.036)	-0.086** (0.037)	-0.063* (0.038)	0.141*** (0.046)
N	2,654	2,718	2,718	2,654
N in 3T	1,738	1,778	1,778	1,738
N in 2T	916	940	940	916

Panel B: Comparing 3T with 2C

	Normalized End line General Score (Y3)	Normalized End line Telugu Score (Y3)	Normalized End line Math Score (Y3)	Normalized End line English Score (Y3)
Offered	0.018 (0.040)	-0.079** (0.039)	-0.053 (0.041)	0.178*** (0.053)
N	4,527	4,622	4,622	4,527
N in 3T	1,738	1,778	1,778	1,738
N in 2C	2,789	2,844	2,844	2,789

# Test Score Impact – by Medium of Instruction

Panel A: Scholarship students who go to English medium schools

	Normalized End line General Score (Y3)	Normalized End line Telugu Score (Y3)	Normalized End line Math Score (Y3)	Normalized End line English Score (Y3)
Offered	0.056 (0.061)	-0.205*** (0.063)	-0.152** (0.068)	0.517*** (0.083)
N	3,239	3,300	3,300	3,239
N in 3T	450	456	456	450
N in 2C	2,789	2,844	2,844	2,789

Panel B: Scholarship students who go to Telugu medium schools

	Normalized End line General Score (Y3)	Normalized End line Telugu Score (Y3)	Normalized End line Math Score (Y3)	Normalized End line English Score (Y3)
Offered	0.002 (0.046)	-0.037 (0.047)	-0.028 (0.048)	0.057 (0.058)
N	3,934	4,014	4,014	3,934
N in 3T	1,145	1,170	1,170	1,145
N in 2C	2,789	2,844	2,844	2,789

# Test Score Impact – by Medium of Instruction (2)

Panel C: ITT Estimates by Village Type

	Normalized End line General Score (Y3)	Normalized End line Telugu Score (Y3)	Normalized End line Math Score (Y3)	Normalized End line English Score (Y3)
Villages with English Medium Schools only				
Offered	0.163** (0.074)	-0.071 (0.080)	0.012 (0.092)	0.548*** (0.088)
N	1,255	1,274	1,274	1,255
Villages with Telugu Medium Schools only				
Offered	0.047 (0.083)	0.061 (0.088)	0.003 (0.087)	0.052 (0.106)
N	825	842	842	825
Villages with both English and Telugu medium private schools				
Offered	-0.058 (0.058)	-0.115** (0.053)	-0.117** (0.059)	0.054 (0.081)
N	2,382	2,438	2,438	2,382

# Test Score Impact: Spill-overs to Other Groups

Panel A: Comparing Non-Applicants from Government Schools

	Normalized End line General Score (Y3)	Normalized End line Telugu Score (Y3)	Normalized End line Math Score (Y3)	Normalized End line English Score (Y3)
Group 1	0.050 (0.062)	-0.025 (0.069)	0.046 (0.064)	0.119 (0.075)
N	1,008	1,030	1,030	1,008
N in 1T	476	490	490	476
N in 1C	532	540	540	532

Panel B: Comparing Non-scholarship students from Private Schools

	Normalized End line General Score (Y3)	Normalized End line Telugu Score (Y3)	Normalized End line Math Score (Y3)	Normalized End line English Score (Y3)
Group 4	-0.012 (0.048)	0.063 (0.049)	0.027 (0.058)	-0.119* (0.066)
N	1,346	1,386	1,386	1,346
N in 4T	704	717	717	704
N in 4C	642	669	669	642

# Test Score Impact: Treatment on Treated

	Normalized End line General Score (Y3)	Normalized End line Telugu Score (Y3)	Normalized End line Math Score (Y3)	Normalized End line English Score (Y3)
Accepted	0.032 (0.070)	-0.142** (0.070)	-0.095 (0.074)	0.316*** (0.093)
N	4,527	4,622	4,622	4,527
N in 3T	1,738	1,778	1,778	1,738
N in 2C	2,789	2,844	2,844	2,789

# Test Score Impact: Accounting for Attrition

**Table: Treatment Effect with Inverse Probability Weighted to account for differential attrition probability**

	Normalized End line General Score (Y3)	Normalized End line Telugu Score (Y3)	Normalized End line Math Score (Y3)	Normalized End line English Score (Y3)
Offered	0.020 (0.045)	-0.071* (0.043)	-0.047 (0.045)	0.172*** (0.060)
N	4,527	4,622	4,622	4,527
N in 3T	1,738	1,778	1,778	1,738
N in 2C	2,789	2,844	2,844	2,789

**Table: Upper and Lower Bound Estimates of Treatment Effect (Lee Bounds)**

	Normalized End line General Score (Y3)	Normalized End line Telugu Score (Y3)	Normalized End line Math Score (Y3)	Normalized End line English Score (Y3)
Upper Bound Estimate	0.095	0.001	0.033	0.251
Standard Error	0.051	0.051	0.055	0.082
Lower bound Estimate	-0.035	-0.119	-0.116	0.091
Standard Error	0.062	0.063	0.066	0.088
Confidence Intervals	[-0.155, 0.194]	[-0.242,0.100]	[-0.245,0.140]	[-0.081,0.411 ]

# Test Score Impact: Aggregate Impact

Table: Aggregate Treatment Effect Across All Villages

	Group 1	Group 2	Group 3	Group 4	All Villages
Normalized End line General Score (Y3)	0.050 (0.062)	0.012 (0.044)	0.018 (0.040)	-0.012 (0.048)	<b>0.048</b> <b>(0.047)</b>
Normalized End line Telugu Score (Y3)	-0.025 (0.069)	0.006 (0.042)	-0.079** (0.039)	0.063 (0.049)	0.056 (0.043)
Normalized End line Math Score (Y3)	0.046 (0.064)	0.008 (0.045)	-0.053 (0.041)	0.027 (0.058)	0.052 (0.048)
Normalized End line English Score (Y3)	0.119 (0.075)	0.031 (0.057)	0.178*** (0.053)	-0.119* (0.066)	0.023 (0.065)
Population	10267	4453	1980	30050	
Sample Size	1554	3784	1778	2258	
Sampling Weights	6.94	1.15	1.1	13.3	



# Summary and Discussion

- ✦ Paper presents results from the first school-choice experiment in India (designed to mimic key provisions of the RtE Act)
- ✦ Process indicators are a lot better for the private schools
- ✦ Parental satisfaction is also significantly higher
- ✦ But no significant impact on average test scores
  - ◆ Important heterogeneity by subject/language of instruction
- ✦ Mixed results for the private school/voucher debate
  - ◆ Parental/HH factors may account for most of the cross-sectional gaps
  - ◆ But: What levels of learning are private schools optimized for?
  - ◆ Adjustment issues?
  - ◆ Value of scholarship is ~40% of per child spending in govt. schools