Teacher Performance Pay: Experimental Evidence from India

Karthik Muralidharan
Harvard University

(with Venkatesh Sundararaman, World Bank)

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Why Do We Care?

- Very low levels of learning in India
  - -52% of children aged 7-14 in India cannot read a simple paragraph, though 93% enrolled in school (PRATHAM, 2005)

- Large inefficiencies in delivery of health and education
  - -In India, 25% teachers are absent, less than half are teaching
  - -Over 90% of non-capital spending goes to teacher salaries
  - -Teachers are very well paid
    - (~ 4 * GDP/Capita); Pay = f (rank, experience)
  - -No performance-based component
  - -Correlations suggest that higher 'levels' of pay are not associated with better teacher performance
  - -Strong unions, almost impossible to fire (only 1 in 3000 schools reported firing a teacher for repeated absence)

- Performance pay for teachers is a frequently suggested way for improving school quality (being tried in many countries) – but limited evidence on effectiveness

Teacher Performance Pay – Promises & Pitfalls

The promise of performance-pay for teachers

- -Can improve teacher motivation and lead them to increase the amount of effort spent on teaching
- -Can improve 'professional' orientation of the teaching profession when good performance is measured, recognized, and rewarded
- -Can encourage teachers to invest more in their own long-term development if more effective teaching is rewarded
- -Can attract higher ability teachers into the profession

But performance-pay can also be counter-productive

- -Could reduce intrinsic motivation
- -Could induce 'teaching to the test' instead of deeper learning
- -Could lead to various kinds of dishonesty (outright cheating, manipulating test-taking population, etc.)

Theoretical prediction about performance-based pay for teachers is ambiguous and empirical evidence is mixed

- -Today's talk presents evidence from the first large-scale randomized evaluation of teacher performance pay in a representative sample of schools in any country

Questions/Contributions

- Does teacher performance-pay improve test scores
- What, if any, are the negative consequences?
- Should they be at the school or teacher level?
- How does teacher behavior change?
- How cost effective is the incentive program?
- How will teachers respond to the idea?

Location of Study

- Indian State of Andhra Pradesh (AP)
  - -5th most populous state of India
    - Population of 80 Million
  - -23 Districts (2-4 Million each)

- Close to All-India averages on many measures of human development

	India	AP
Gross Enrollment (6-11) (%)	95.9	95.3
Literacy (%)	64.8	60.5
Teacher Absence (%)	25.2	25.3
Infant Mortality (per 1000)	63	62

ncentive Design

Teachers were given bonus payments over and above their regular salary on the basis of average improvement of test scores of all students in grade/school over base line

- Subjects considered were math and language
- Assessment papers were designed by an independent testing agency (EI)
- All assessments were conducted by an independent NGO (APF)

Bonus formula

- Rs. 500 bonus for every 1% point improvement in average scores over 5%
- So a teacher whose students improvement was 10% would get a bonus equal to Rs. 2,500/year (base salary is ~Rs 7,500/month)

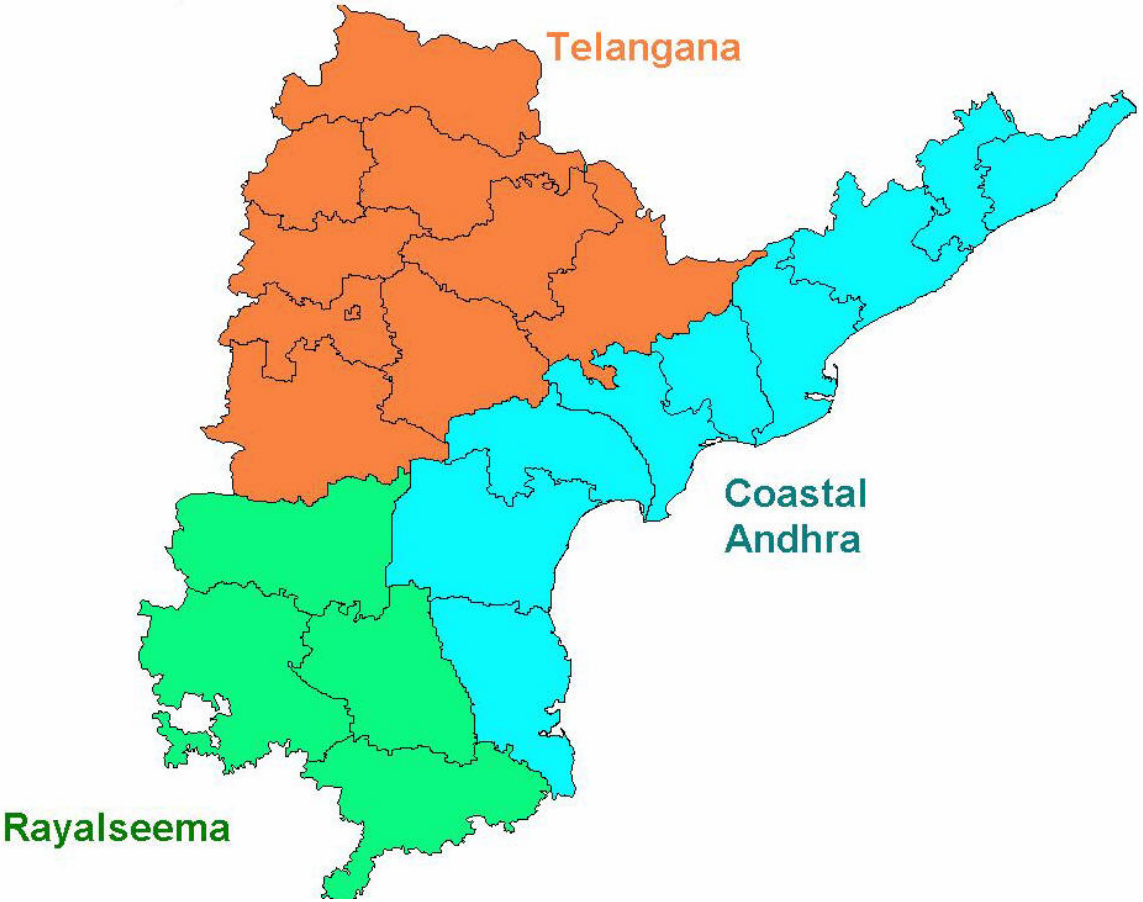
Both group and individual level incentives were studied

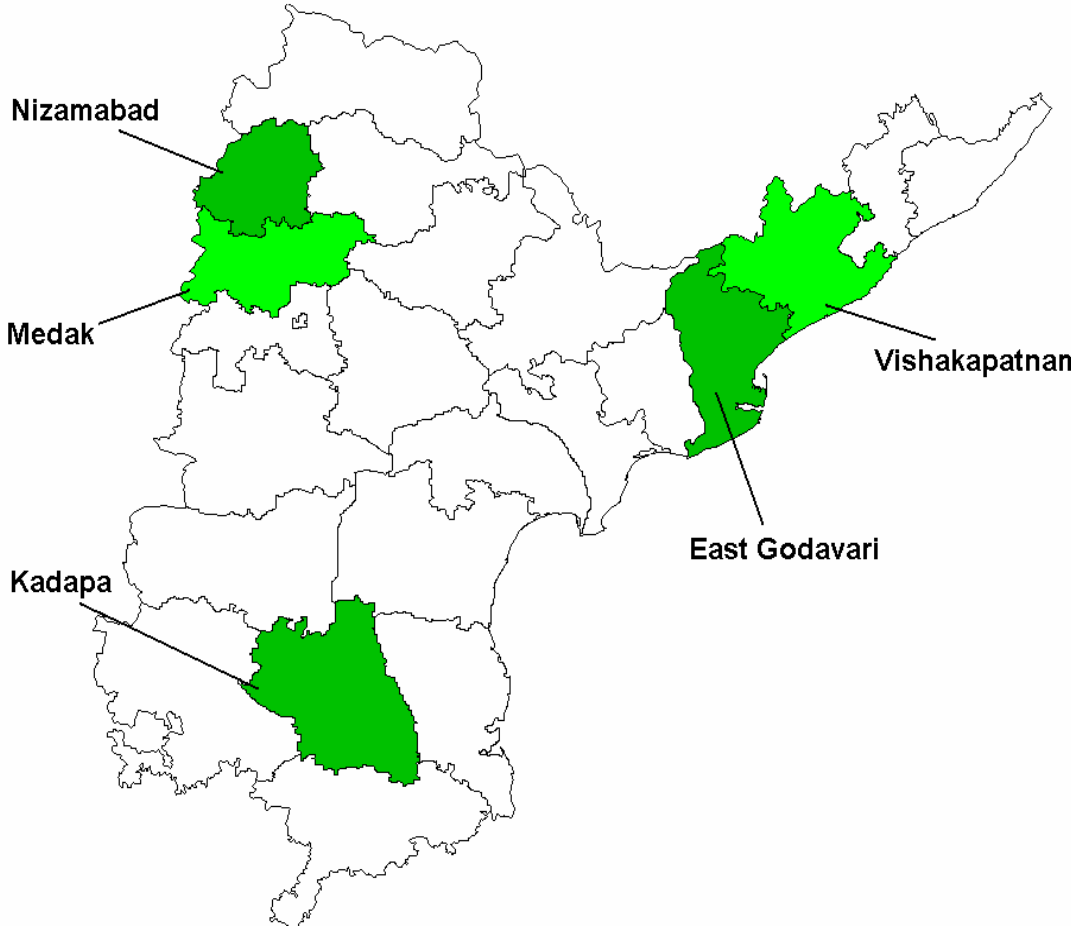
- Relative effectiveness is not clear
- Free-riding
- Peer monitoring
- Gains to cooperation

Design Overview

	INCENTIVES (Conditional on Improvement in Student Learning)			
INPUTS (Unconditional)		NONE	GROUP BONUS	INDIVIDUAL BONUS
	NONE	CONTROL (100 Schools)	100 Schools	100 Schools
	EXTRA PARA TEACHER	100 Schools		
	EXTRA BLOCK GRANT	100 Schools		

Sampling


Telangana
Coastal
Andhra
Rayalseema


Nizamabad
Medak
Vishakapatnam
East Godavari
Kadapa

Summary of Experimental Design

Study conducted across a representative sample of 500 primary schools in 5 districts of AP

Conduct baseline tests in these schools (June/July 05)

Stratified random allocation of 100 schools to each treatment (2 schools in each mandal to each treatment) (August 05)

Monitor process variables over the course of the year via unannounced monthly tracking surveys (Sep 05 – Feb 06)

Conduct 2 rounds of endline tests to assess the impact of various interventions on learning outcomes (March/April 06)

Interview teachers after program but before outcomes are communicated to them (August 06)

Provide bonus payments and communicate continuation of program (Sept 06)

Specification

$$T_{ijkm}(EL) = \alpha \ + \gamma \cdot T_{ijkm}(BL) + \delta \cdot Incentives + \beta \cdot Z_m + \varepsilon_k + \varepsilon_{jk} + \varepsilon_{ijk}$$

$$i = Child\ ,\ j = Class\ , k = School\ , m = Mandal\ (Sub - District\ )$$

Impact of Incentives on Test Scores

Table 2: Impact of Incentives on Student Test Scores

	Dependent Variable = Normalized End of Year Test Score						
	Combined			**Maths**		**Telugu**	
	Year 1 on Year 0	**Year 2 on Year 1**	**Year 2 on Year 0**	**Year 1 on Year 0**	**Year 2 on Year 0**	**Year 1 on Year 0**	**Year 2 on Year 0**
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Normalized Lagged Test Score	0.5	0.553	0.45	0.49	0.418	0.516	0.484
	(0.013)***	(0.016)***	(0.015)***	(0.017)***	(0.022)***	(0.014)***	(0.014)***
Incentive School	**0.153**	**0.143**	**0.217**	**0.188**	**0.277**	**0.119**	**0.158**
	(0.042)***	(0.035)***	(0.047)***	(0.049)***	(0.055)***	(0.038)***	(0.043)***
Observations	68702	78613	49516	34121	24592	34581	24924
R-squared	0.29	0.29	0.23	0.28	0.22	0.32	0.25

ncentives Improved Results Across the Board

The performance-pay program improved performance for
- -All 5 grades
- -All 5 districts
- -All levels of question difficulty

Similarly, improvements were seen for
- -All levels of household affluence and literacy
- -Children with high as well as low baseline scores
- -All types of teachers
  - Senior/junior, male/female, high/low qualifications/training

The distribution of test score gains in incentive schools first order stochastically dominates that of the control schools – no one was worse off

Mechanical versus Conceptual - Examples

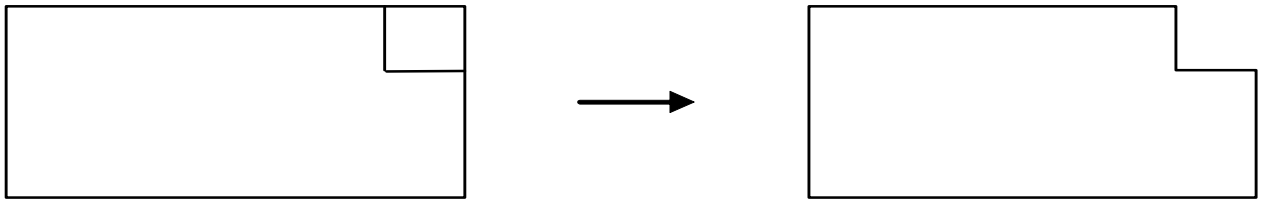
Question 1: 34
x 5

Question 2: Put the correct number in the empty box:

8 + 8 + 8 + 8 + 8 + 8 = 8 x ☐

Question 1: What is the area of the square below? _____

Question 2: A square of area 4 sq. cm is cut off from a rectangle of area 55 sq. cm.



What is the area of the remaining piece? _____ sq. cm

Impact of Incentives by Mechanical/Conceptual

Table 6: Impact of Incentives on Mechanical Versus Conceptual Learning (Combined)

	Dependent Variable = Endline Test Score by Mechanical/Conceptual (Normalized by Mechanical/Conceptual Distribution in Control Schools)			
	Year 1 on Year 0		**Year 2 on Year 0**	
	Mechanical	**Conceptual**	**Mechanical**	**Conceptual**
	[1]	[2]	[5]	[6]
Normalized Baseline Score	0.482	0.338	0.445	0.306
	(0.012)***	(0.011)***	(0.012***)	(0.012***)
Incentive School	0.134	0.135	0.167	0.178
	(0.038)***	(0.042)***	(0.041***)	(0.045***)
Observations	69310	69310	42884	42884
R-squared	0.28	0.17	0.23	0.15

Performance on Non-Incentive Subjects

Table 7: Impact of Incentives on Non-Incentive Subjects

	Year 1 on Year 0		Year 2 on Year 0	
	Science	**Social Studies**	**Science**	**Social Studies**
	[1]	[2]	[1]	[2]
Normalized Baseline Math Score	0.214	0.222	0.223	0.225
	(0.019)***	(0.018)***	(0.032)***	(0.322)***
Normalized Baseline Language	0.206	0.287	0.238	0.232
	(0.019)***	(0.019)***	(0.019)***	(0.035)***
Incentive School	0.107	0.135	0.205	0.233
	(0.052)**	(0.047)***	(0.065)***	(0.064)***
Observations	12011	12011	2348	2348
R-squared	0.26	0.3	0.28	0.27

Group versus Individual Incentives

Table 8: Impact of Group Incentives versus Individual Incentives

	Dependent Variable = Normalized Endline Test Score		
	Year 1 on Year 0	**Year 2 on Year 1**	**Year 2 on Year 0**
	[1]	[2]	[3]
Normalized Lagged Score	0.50	0.55	0.45
	(0.013)***	(0.016)***	(0.015)***
Group Incentive School (GI)	0.15	0.09	0.16
	(0.050)***	(0.045)*	(0.058)***
Individual Incentive School (II)	0.16	0.20	0.27
	(0.049)***	(0.044)***	(0.058)***
Observations	68702	78613	49516
F-Stat p-value (Testiing GI = II)	0.78	0.05	0.12
R-squared	0.29	0.3	0.23

How Did Teacher Behavior Change?

Table 11: Teacher Behavior (Observation and Interviews)

Teacher Behavior	Incentive versus Control Schools (All figures in %) Incentive Schools	Control Schools	p-Value of Difference
Teacher Absence (%)	26.27	26.34	**0.88**
Actively Teaching at Point of Observation (%)	40.1	42.2	**0.35**
Did you do any special preparation for the end of year tests? (% Yes)	74.6	52.7	**0.000*** **
What kind of preparation did you do? (UNPROMPTED) (% Mentioning)			
Extra Homework	57.2	35.8	**0.000*** **
Extra Classwork	58.7	41.2	**0.000*** **
Extra Classes/Teaching Beyond School Hours	22.5	11.1	**0.000*** **
Gave Practice Tests	36.0	21.8	**0.000*** **
Paid Special Attention to Weaker Children	24.9	10.7	**0.000*** **

Impact of Para-teacher and Block Grants

Table 9: Impact of Vidya Volunteers and Block Grant on Learning Outcomes

	Dependent Variable = Normalized Endline Test Score		
	Year 1 on Year 0	**Year 2 on Year 1**	**Year 2 on Year 0**
	[1]	[2]	[3]
Normalized Lagged Score	0.52	0.55	0.47
	(0.012)***	(0.012)***	(0.015)***
Vidya Volunteer (VV)	0.09	0.09	0.11
	(0.037)**	(0.035)**	(0.050)**
Block Grant (BG)	0.09	0.01	0.06
	(0.039)**	(0.036)	(0.045)
Observations	66416	77744	49367
F-Stat p-value (Testiing VV = BG)	0.97	0.07	0.26
R-squared	0.31	0.29	0.22

Comparison of Inputs and Incentives

Table 13: Impact of Inputs versus Incentives on Learning Outcomes

	Dependent Variable = Normalized Endline Test Score		
	year 1 on year 0	**year 2 on year 1**	**year 2 on year 0**
	[1]	[2]	[3]
Normalized Lagged Score	0.51	0.58	0.46
	(0.010)***	(0.014)***	(0.012)***
Inputs (VV and BG)	0.10	0.04	0.08
	(0.037)***	(0.040)	(0.043)***
Incentives (GI and II)	0.16	0.13	0.22
	(0.049)***	(0.044)***	(0.048)***
Observations	112238	88887	82596
F-Stat p-value (Testiing GI = II = VV = BG)	0.09	0.00	0.00
R-squared	0.29	0.29	0.21

Long Run Cost-Benefit Analysis

- Not clear that incentive payment is a real ‘cost’ since it is just another way of paying a salary

- Suppose for example that there is a scheduled 3% across the board salary increase scheduled every year
  - -Then you could introduce a performance-pay program that pays a bonus of between 0 and 6% of base pay based on performance
  - -Average cost will still be 3%, and there will be limited additional fiscal burden
  - -But the benefits of performance-pay can be obtained

- Should especially be considered if there is a large increase in pay being considered (Sixth Pay Commission)

- Administrative cost of incentive program ~50% of incentive cost in the study
  - -Likely to be an over estimate since no economies of scale

Teachers Liked the Program

- Teachers interviewed in August 06 (before they know outcomes)
- 75% of teachers say the program increased their motivation
  - 25% say their motivation was unchanged
- 85% of teachers had a favorable opinion about the idea of bonus payments on the basis of improvement in student performance
- 68% thought that the government should try and scale up this program in all schools
- 75% were willing to accept a performance-pay system even under neutrality of the total wage bill
- Teachers who show greater support for performance-pay (ex ante) are also likely to have performed better (ex post)
  - Implications for sorting into teaching profession

Policy Implications

- Performance pay for teachers is likely to be a highly cost-effective policy for improving learning outcomes
  - -2 years of data suggests unlikely to be a 'novelty effect'
  - -Continued gains on both mechanical and conceptual components as well as non-incentive subjects suggests that distortions from multi-tasking are less of a concern in a context of very low levels of learning

- Can combine elements of both group and individual-level performance pay

- Can be largely cost/budget neutral when implemented in the context of an across the board salary increase

- The broader point is that of creating a meaningful career ladder for teachers so that their professional trajectories depend on performance (can experiment with including other measures so the weight on test-score gains is not 100%)

- Implementation details are critical and the key next step will be to build systems and infrastructure to do this

Ongoing and Future Research

- AP RESt is a long-term action-research project that is expected to continue at least until 2011
  - -5-year MoU signed between GoAP and Azim Premji Foundation
  - -We hope to systematically study the effectiveness of the most promising policy options to improve education in India
  - -Hope to follow a sub-sample for an extended period to get long-term outcomes

- Performance Pay for Teachers (group and individual)
- Para-teachers (locally hired under different contract structure)
- Cash block grants to schools (focused on student-used inputs)

- Student Incentives (based on levels and improvements of scores)
- Extra regular teacher (can compare with para-teacher)
- School Choice/Scholarships (including aggregate effects)
- School Health (including various delivery models)
- Teacher training programs

- Studying each of these policy options in the *same* context makes AP RESt a unique test bed for research on education and service delivery in India and in developing countries more generally