

Incentives for Academic Achievement: An Experimental Study

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Abstract: A field experiment provided cash incentives conditional on academic outcomes to eighth graders in public schools in the suburbs of Kathmandu, Nepal. Each student could earn a maximum of 500 rupees (approximately 7 US dollars) every semester. Preliminary analysis shows that recipients have higher score than non-recipients in some subjects, the scores are similar in other subjects, and lower in yet other subjects.. Survey responses of students shows that that external rewards had no adverse effect students' intrinsic motivation to learn.

Introduction

In recent years, economists and educators have experimented with a number of innovations to increase school enrollment and improve academic outcomes of children. Conditional cash transfer programs, where parents receive cash reward conditional on their children's school attendance, have shown to increase school attendance in developing countries. This study investigates if providing cash incentives to students conditional on grades improves the educational performance.

Methodology

A randomized field experiment was conducted in public schools in the suburbs of Kathmandu in Nepal. From a pool of 33 schools, 11 schools were randomly chosen to be in the treatment group while the remaining 22 schools constituted the control group. Grade 8 students in treatment schools received cash incentive for their performance in each of three semester exams held in the academic year 2009/10. The reward was 5 rupees (~7 US cents) per point for students scoring more than the passing threshold of 32 and 2.5 rupees (~3.5 US cents) for those scoring less than 32. Students could score a maximum of 100 points each semester. Grade 8 students were chosen for the study because they take a district level exam at the end of the year. This ensures that the endline test is the same for all students, even those from different schools. The total sample size is 1511 students with 390 students in the treatment group.

Table 1 shows that randomization was largely successful in splitting the sample into two similar groups.

Table 1: Sample Balance Across Treatment Arms

	Treatment			Control			P-value for equality of two groups
	Mean	Std. Dev.	N	Mean	Std. Dev.	N	
School Level Variables							
Total Enrollment*	363.6	178.0	11	421.9	262.2	21	0.51
Number of Teachers	19.5	6.4	11	22.7	7.7	21	0.25
Pupil Teacher Ratio	18.5	6.5	11	18.4	9.2	21	0.97
Infrastructure Index (0-7)**	5.6	1.1	11	6	1.02	22	0.25
Number of Buildings	3.6	0.8	11	4.0	1.9	22	0.60
Number of Rooms	16.7	7.5	11	20.1	7.4	22	0.23
Baseline Scores***							
Nepali	47.7	11.9	340	43.7	11.6	845	0.13
English	43.1	14.6	338	41.1	13.2	845	0.61
Math	38.2	15.6	337	38.4	15.4	845	0.94
Science	47.6	14.9	339	45.9	16.1	845	0.55
Social Studies	51.4	13.1	340	47.0	14.0	845	0.11
Proportion of students repeating grade 8	0.11	0.32	374	0.09	0.28	1036	0.76

Econometric Specification

The impact of incentives on students' achievement is estimated using the following equation . A random effect model is also fitted to take advantage of panel data. Scores are normalized with respect to the mean and standard deviation of scores in control schools. All reported standard errors are clustered at the school level to allow for correlation across observations within the same school.

$$S(1)_{i,j} = \beta_0 + \beta_1 *incentives + \beta_2 * S(0)_{i,j} + \varepsilon_j + \varepsilon_{i,j}$$

Table 2: Impact of Incentives (β_2) on Academic Achievement

Coefficient	OLS		Random Effect	
		N		N
Nepali	0.04 (0.17)	1089	0.03 (0.16)	2537
English	-0.28 (0.18)	1105	-0.23 (0.14)	2560
Math	-0.01 (0.08)	1088	0.01 (0.09)	2536
Science	0.18 (0.13)	1094	0.23 (0.10)**	2544
Social Studies	0.02 (0.21)	1098	0.01 (0.18)	2547
Health and Physical Education	0.36 (0.22)	986	0.39 (0.19)**	2412
Population and Environment	0.08 (0.33)	898	0.05 (0.35)	2314
Moral Science	-0.32 (0.36)	449	-0.36 (0.26)	1332
Vocational Studies	-0.40 (0.29)	708	-0.30 (0.26)	1864

* significant at 10% level **significant at 5% level ***significant at 1% level

Findings

Table 2 shows that incentive recipients performed better than non recipients in some subjects (science, and health and physical education), about the same on other subjects (nepali, math, social studies, and population and environment), and worse in yet other subjects (english, moral science, and vocational studies), although clustered errors are large enough such that these estimates are statistically insignificant. These results are largely consistent with the recent findings from a study by Roland Fryer (2010) in urban school districts in the US.

Effect on Intrinsic Motivation

Psychologists argue that providing external rewards to students could have adverse impact on their intrinsic motivation to learn. A survey conducted at the end of the year asked students how interested were they in learning each subject. The students had four options to choose from: highly interested (1), moderately interested (2), not very interested (3), not interested at all (4). Table 3 shows that there is no significant difference in students' interest to learn in all but two subjects, and the impact run in different directions in the two subjects. These results show that incentives had little impact on intrinsic motivation of students.

Table 3: Impact of Incentives on Intrinsic Motivation

	Treatment			Control			P-value for equality of two groups (unclustered standard errors)
	Mean	Std. Dev.	N	Mean	Std. Dev.	N	
Nepali	1.52	0.59	299	1.53	0.56	838	0.95
English	1.65	0.72	298	1.61	0.64	837	0.39
Math	1.63	0.76	298	1.61	0.74	837	0.57
Science	1.43	0.62	297	1.46	0.61	834	0.61
Social Studies	1.52	0.63	297	1.60	0.62	833	0.07*
Health and Physical Education	1.69	0.61	298	1.61	0.61	707	0.05**
Population and Environment	1.75	0.66	298	1.68	0.65	705	0.16
Moral Science	1.73	0.72	183	1.80	0.79	440	0.31
Vocational Studies	1.74	0.72	253	1.76	0.69	545	0.81

* significant at 10% level **significant at 5% level ***significant at 1% level

Discussion and Future Direction

The observed data is likely consistent with the theory of multitasking moral hazard. In response to incentives, instead of increasing total effort, students reallocate effort towards subjects with the highest marginal rates of return to effort. Further study is necessary to test this hypothesis directly.

In contrast to both economists' and psychologists' claim of monotonic effect of incentives on performance, Gneezy and Rusticini (QJE 2000) find a non-monotonic relationship. Subjects who receive small financial compensation perform worse than those who do not, but those who receive a large amount do better than non-recipients. The study should be extended by providing a range of compensation amount to see if the result holds in educational settings.

References

- 1) Fryer Jr., Roland G. "Financial Incentives and Student Achievement: Evidence from Randomized Trials." Harvard University Working Paper (2010)
- 2) Gneezy, Uri, and Aldo Rusticini. "Pay Enough or Don't Pay at All." *Quarterly Journal of Economics* 115(2000):791-810.

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