Designing Teacher Performance Pay Programs: Experimental Evidence from Tanzania

Isaac Mbiti (UVA)
Mauricio Romero (UCSD)
Youdi Schipper (Twaweza)

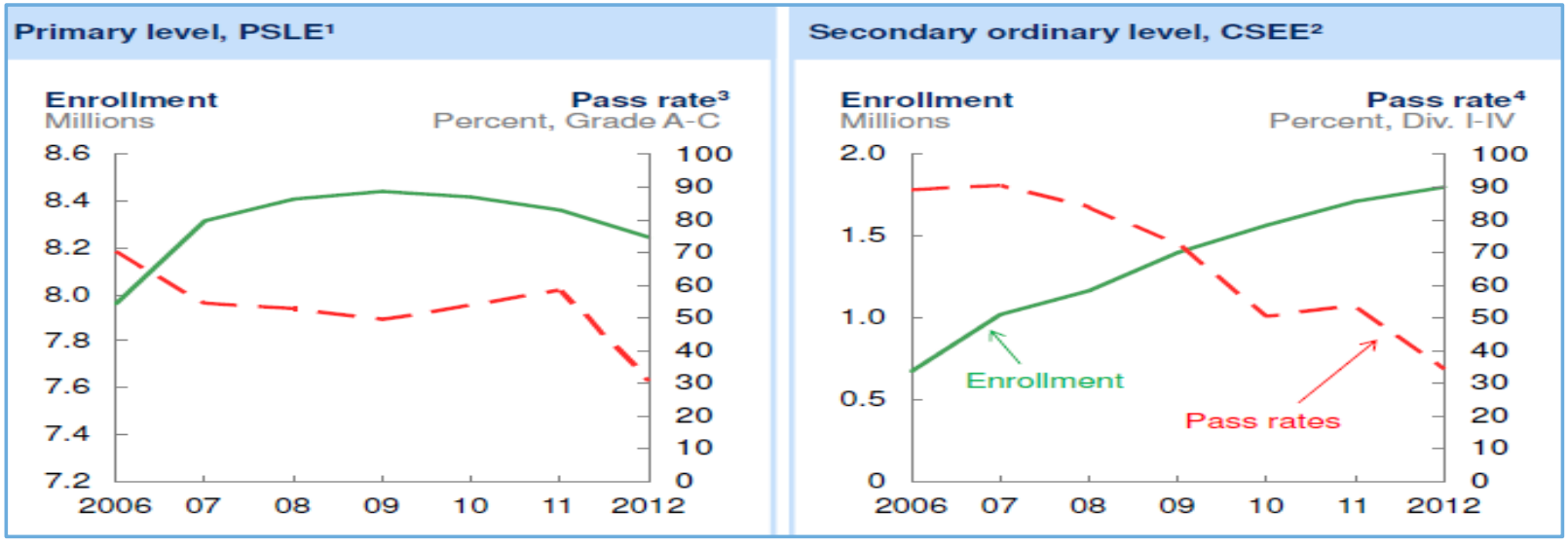
June 22nd, 2018

RISE Conference, Oxford

Background/Motivation

- In Tanzania, net enrollment rate in primary rose from ∼50% to ∼90% between 2000-2012
- 38% of children aged 9-13 pass basic tests of grade 2 reading and numeracy (Uwezo, 2017)
- In 2012 31% of students passed Secondary Leaving exam (CSEE)

Figure: Enrolment, pass rates TZ, 2006-2012



Background/Motivation

- Tanzania spends $\sim$ 3.5% of GDP (17% of budget) on education
- Teacher salaries are the largest component of education budgets
  - 66% of overall budget and 82% of primary budget
  - Mean teacher pay is over 4x GDP per capita
- But teacher motivation is problematic
  - Teacher classroom attendance: SDI 36%, 54%; KiuFunza: 35%, 41%
  - 30% of teachers are at school but not in class

Background/Motivation

- Teachers have central role in education production function and the education budget. How can effectiveness be improved?
- Twaweza focus on accountability, value for money: pay reform
- Teacher pay: usual determinants of teacher salaries are not correlated with student performance (Bettinger & Long, 2004; Kane, Rockoff, & Staiger, 2008; Woessmann, 2011).
- Unconditional teacher pay increase led to zero improvement in student learning outcomes in Indonesia (De Ree et al., 2018).

Background/Motivation

- Teachers have central role in education production function and the education budget. How can effectiveness be improved?
- Twaweza focus on accountability, value for money: pay reform
- Teacher pay: usual determinants of teacher salaries are not correlated with student performance (Bettinger & Long, 2004; Kane et al., 2008; Woessmann, 2011).
- Unconditional teacher pay increase led to zero improvement in student learning outcomes in Indonesia (De Ree et al., 2018).
- Teacher performance pay programs can potentially improve effort/effectiveness of teachers... However, the evidence is mixed

Background/Motivation

- Teachers have central role in education production function and the education budget. How can effectiveness be improved?
- Twaweza focus on accountability, value for money: pay reform
- Teacher pay: usual determinants of teacher salaries are not correlated with student performance (Bettinger & Long, 2004; Kane et al., 2008; Woessmann, 2011).
- Unconditional teacher pay increase led to zero improvement in student learning outcomes in Indonesia (De Ree et al., 2018).
- Teacher performance pay programs can potentially improve effort/effectiveness of teachers... However, the evidence is mixed
  - Positive effects (Lavy, 2002, 2009; Glewwe et al., 2010; Muralidharan & Sundararaman, 2011)

Background/Motivation

- Teachers have central role in education production function and the education budget. How can effectiveness be improved?
- Twaweza focus on accountability, value for money: pay reform
- Teacher pay: usual determinants of teacher salaries are not correlated with student performance (Bettinger & Long, 2004; Kane et al., 2008; Woessmann, 2011).
- Unconditional teacher pay increase led to zero improvement in student learning outcomes in Indonesia (De Ree et al., 2018).
- Teacher performance pay programs can potentially improve effort/effectiveness of teachers... However, the evidence is mixed
  - Positive effects (Lavy, 2002, 2009; Glewwe et al., 2010; Muralidharan & Sundararaman, 2011)
  - Little or no effects at all (Springer et al., 2011; Goldhaber & Walch, 2012; Goodman & Turner, 2013)

Background/Motivation

- Teachers have central role in education production function and the education budget. How can effectiveness be improved?
- Twaweza focus on accountability, value for money: pay reform
- Teacher pay: usual determinants of teacher salaries are not correlated with student performance (Bettinger & Long, 2004; Kane et al., 2008; Woessmann, 2011).
- Unconditional teacher pay increase led to zero improvement in student learning outcomes in Indonesia (De Ree et al., 2018).
- Teacher performance pay programs can potentially improve effort/effectiveness of teachers... However, the evidence is mixed
  - Positive effects (Lavy, 2002, 2009; Glewwe et al., 2010; Muralidharan & Sundararaman, 2011)
  - Little or no effects at all (Springer et al., 2011; Goldhaber & Walch, 2012; Goodman & Turner, 2013)
  - Studies not directly comparable: different designs, different contexts

This paper

- Compare two teacher incentive designs: "Levels" versus "Pay for percentile"
  - Vary: mapping of performance to pay
  - Constant features: individual incentive, performance metric is function of test scores only, focal subjects and grades, per student bonus pool, communication strategy

This paper

- Compare two teacher incentive designs: "Levels" versus "Pay for percentile"
  - Vary: mapping of performance to pay
  - Constant features: individual incentive, performance metric is function of test scores only, focal subjects and grades, per student bonus pool, communication strategy
- **1 Levels:** Performance based on several proficiency thresholds (absolute learning levels)

This paper

- Compare two teacher incentive designs: "Levels" versus "Pay for percentile"
  - Vary: mapping of performance to pay
  - Constant features: individual incentive, performance metric is function of test scores only, focal subjects and grades, per student bonus pool, communication strategy
- **1 Levels:** Performance based on several proficiency thresholds (absolute learning levels)
  - One test; easy to implement and communicate
  - Provides clear targets, but has absolute thresholds
  - Not optimal but potentially more effective than a simple pass/fail threshold design

This paper

- Compare two teacher incentive designs: "Levels" versus "Pay for percentile"
  - Vary: mapping of performance to pay
  - Constant features: individual incentive, performance metric is function of test scores only, focal subjects and grades, per student bonus pool, communication strategy
- **1 Levels:** Performance based on several proficiency thresholds (absolute learning levels)
  - One test; easy to implement and communicate
  - Provides clear targets, but has absolute thresholds
  - Not optimal but potentially more effective than a simple pass/fail threshold design
- **2 Pay for percentile:** Performance based on student ranks within "equal starting proficiency groups" (aka "Gains")

This paper

- Compare two teacher incentive designs: "Levels" versus "Pay for percentile"
  - Vary: mapping of performance to pay
  - Constant features: individual incentive, performance metric is function of test scores only, focal subjects and grades, per student bonus pool, communication strategy
- **1 Levels:** Performance based on several proficiency thresholds (absolute learning levels)
  - One test; easy to implement and communicate
  - Provides clear targets, but has absolute thresholds
  - Not optimal but potentially more effective than a simple pass/fail threshold design
- **2 Pay for percentile:** Performance based on student ranks within "equal starting proficiency groups" (aka "Gains")
  - Two tests; harder to implement / communicate
  - Motivates effort across the distribution of students
  - Under certain conditions, induces effort that is socially optimal

Designing Teacher Performance Pay Programs

Set up

Student learning at endline is determined by the following process:

$$a_j^l = a_{j(t-1)}^l + \gamma^l e_j^l + v_j^l$$

- $a_{j(t-1)}^l$ is the student's baseline level of learning
- γ^l captures the productivity of teacher effort (e_j^l)
- v_j^l is an idiosyncratic random shock to student learning
- Effort is costly: $c_l(e_j^l)$

Social planner

Maximize:

$$\sum_j \sum_l \mathbb{E}(a^l_{j(t-1)} + \gamma^l e^l_j + v^l_j) - c_l(e^l_j)$$

The first order conditions for this problem are:

$$\gamma^l = c'_l(e^l_j) \tag{1}$$

for all l and all j.

Pay for percentile

Teachers solve

$$\sum_{l} \left(\sum_{k \neq j} \left(\pi P(a_j^l > a_k^l) \right) - c_l(e_j^l) \right)$$

$$\vdots$$

In a symmetric equilibrium, then

$$(N-1)\pi\gamma^l f^l(0) = c_l'(e^l) \tag{2}$$

If the payoff $\pi = \frac{1}{(N-1)f^l(0)}$, then equilibrium is social optima
Barlevy and Neal (2012)

Levels

Teachers solve

$$\sum_l \left(\sum_t \left(P(a_j^l > T_t) \frac{\Pi_t}{\sum_l \sum_n C_n^l P\left(a_n^l > T_t\right)} \right) - c_l(e_j^l) \right)$$

where T_t is the learning needed to unlock threshold t payment

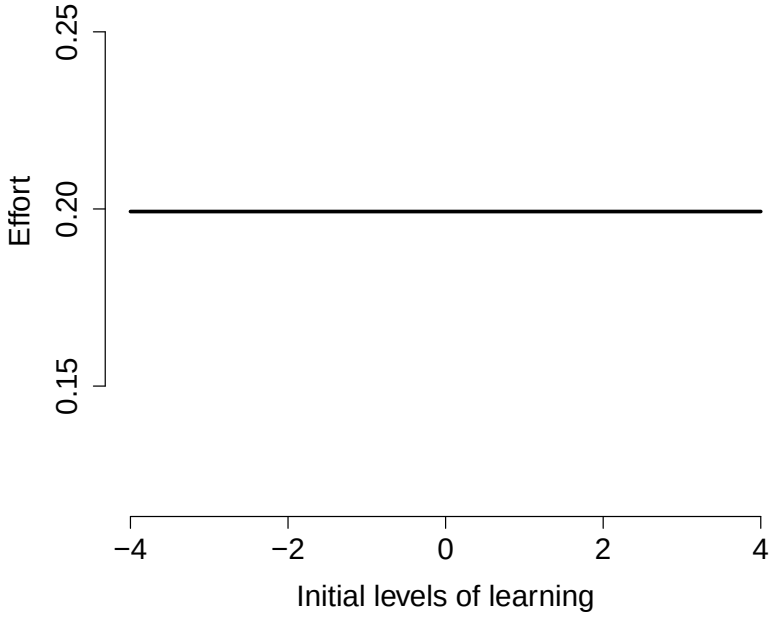
$$\vdots$$

In a symmetric equilibrium, then

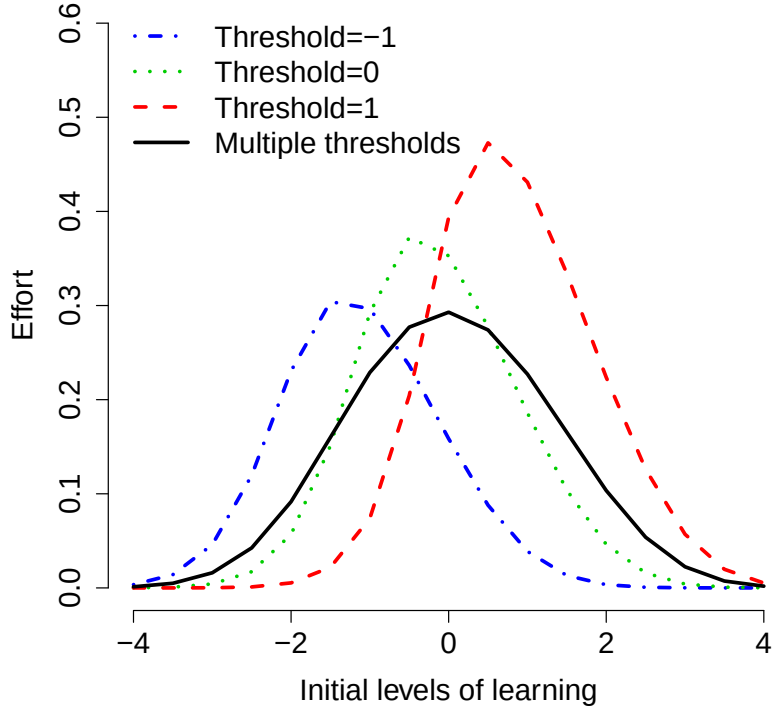
$$\frac{\sum_t \gamma^l g^l(T_t - a^l_{j(t-1)} - \gamma^l e^l)\Pi_t}{\sum_l N C_n^l P\left(v^l > T_t - a^l_{(t-1)} - \gamma^l e^l\right)} = c_l'(e^l) \tag{3}$$

Levels vs Gains - Theory - Part I

Figure: Optimal effort as the productivity of effort and the intial level of learning varies

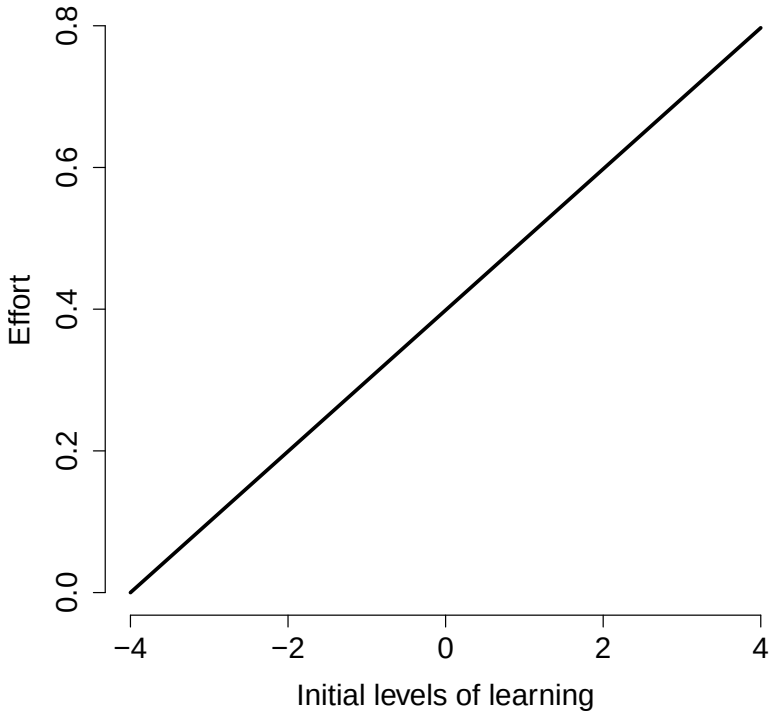


: Gains - γ constant across initial levels of learning

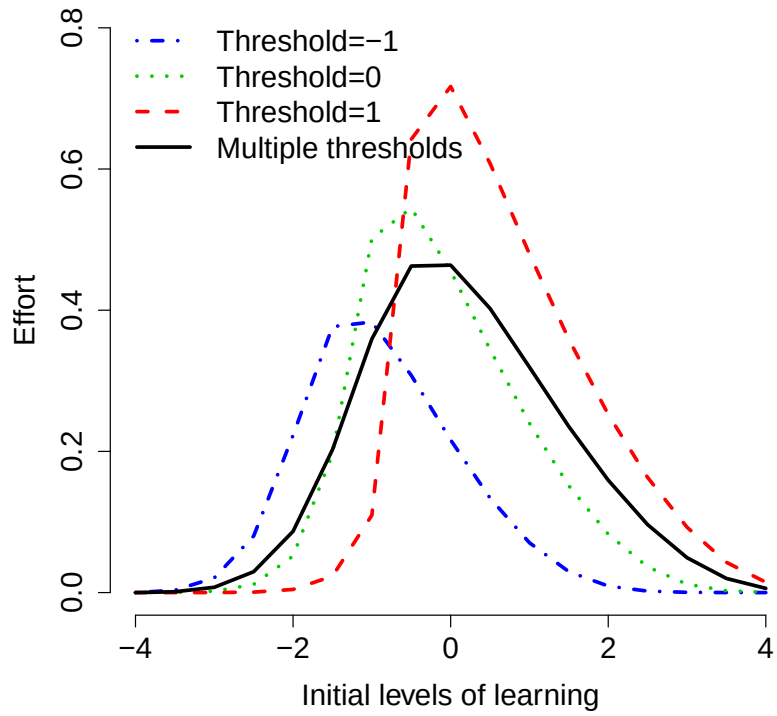


: Levels - γ constant across initial levels of learning

Levels vs Gains - Theory - Part II

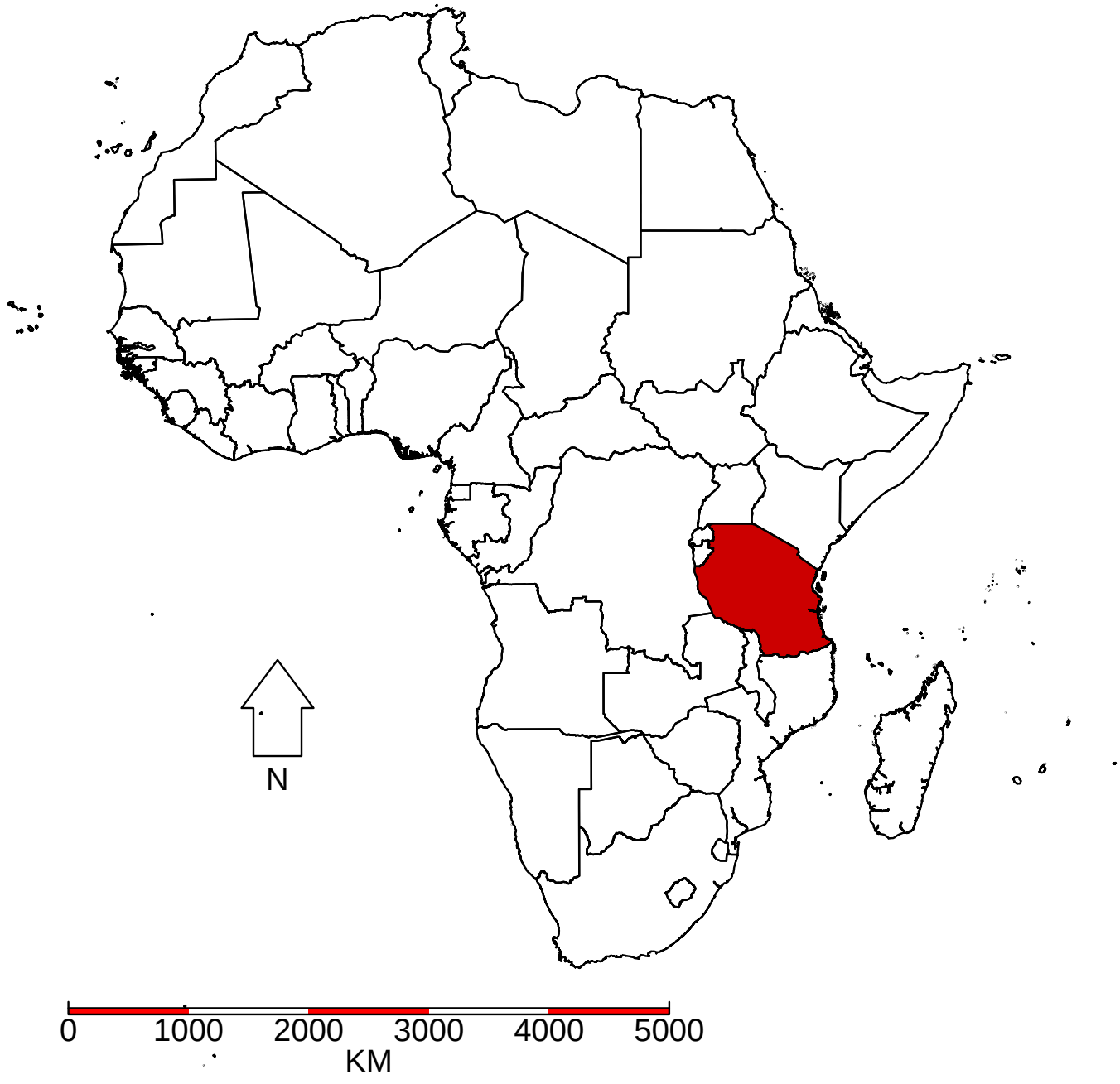


: Gains - γ increases with initial levels of learning



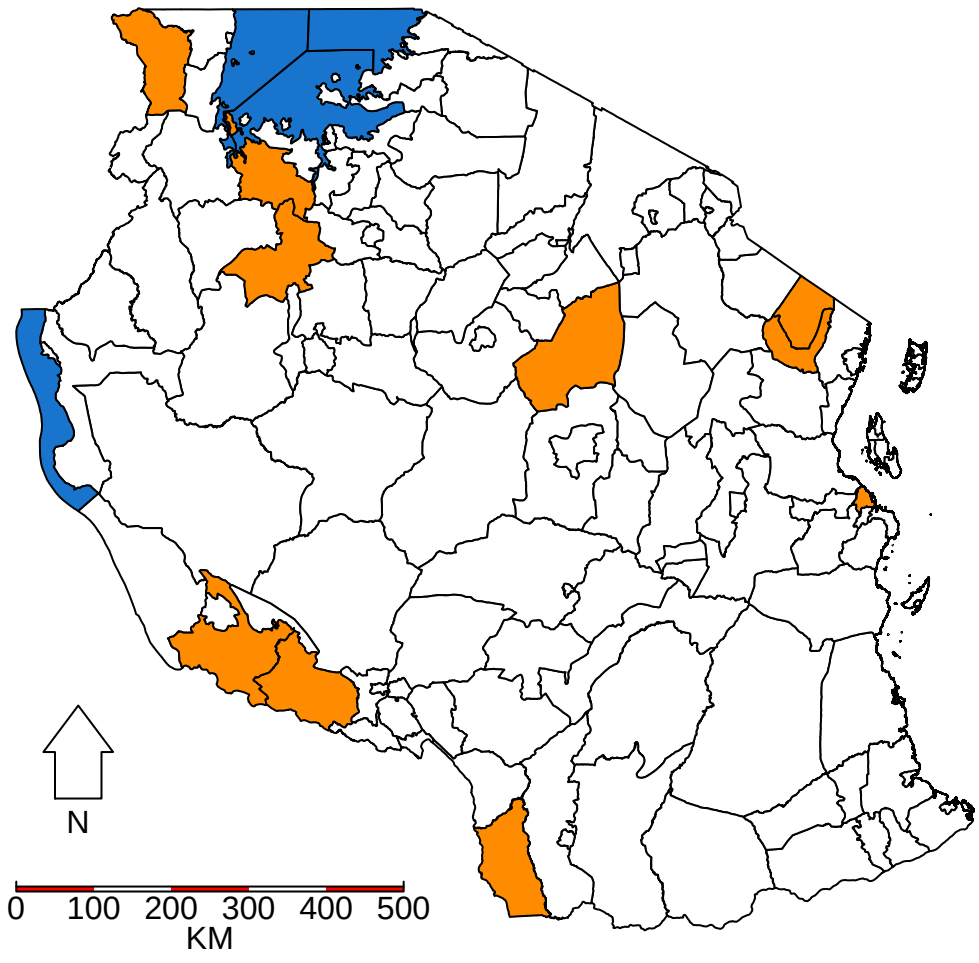
: Levels - γ increases with initial levels of learning

Designing Teacher Performance Pay Programs


N
0
1000
2000
3000
4000
5000
KM

Sampling and Randomization

Figure: Districts in Tanzania from which schools are selected



Sampling and Randomization

- In each district we pick 18 government primary schools
- The sample of 180 schools was taken from a previous RCT (needed baseline scores from students) ▸ *
- From each district 6 schools were assigned to the "levels" treatment, 6 schools to the "P4Pcentile" treatment and 6 schools were left as controls
- All teachers in grades 1-3 teaching Kiswahili, English and Math are eligible for bonuses

Intervention - "Levels"

- Teachers are rewarded for student skill levels
- Bonus pool is fixed (per capita funds equal across grades-subjects)
- Payments for each skill depends on total number of students that pass
- Harder skills, with fewer passes, are rewarded more
- Incentive to focus on students close to each threshold
  - Multiple thresholds
- Teachers with a large fraction of less prepared students at a disadvantage

Skills

Kiswahili	**English**	**Math**
	Grade 1	
Letters	Letters	Counting
Words	Words	Numbers
Sentences	Sentences	Inequalities
		Addition
		Subtraction
	Grade 2	
Words	Words	Inequalities
Sentences	Sentences	Addition
Paragraphs	Paragraphs	Subtraction
		Multiplication
	Grade 3	
		Addition
Story	Story	Subtraction
Comprehension	Comprehension	Multiplication
		Division

Intervention - "Pay for percentile"

- Based on the work of Barlevy and Neal (2012): Induces optimal teacher effort
- Place students in bins according to initial levels of learning
- Bonus funds per capita equal across grades-subjects-bins
- Rank students at the end of the year, within each bin
- Pay teachers according to the rank of their students
  - Higher ranking students earn teachers a bigger bonus, regardless of bin
  - For a student in the top 1% a teacher gets 99 points, and for a student in the bottom 1% he gets no points
  - For a student in the top 1% a teacher receives \$1.77
  - For a student in the top 50% a teacher receives \$0.89
- Payments are based on progression of comparable students

Timeline

Research Activities	Year	Month	Intervention Activities
	2015	Jan	
Baseline		Feb	
		Mar	
		Apr	
		May	Baseline
		Jun	
Midline (Attendance)		Jul	
		Aug	Midline (School Visits)
Endline		Sep	
		Oct	
		Nov	Endline
		Dec	
	2016	Jan	
Baseline		Feb	
		Mar	
		Apr	
		May	Baseline
		Jun	Midline (Back Checks)
		Jul	Midline (Phone Calls)
Midline (Attendance)		Aug	Midline (School Visits)
Endline		Sep	
		Oct	Endline
		Nov	
		Dec	

Data

- School data: facilities, expenditure, enrollment, etc.
- Teacher data: socio-demographic characteristics, qualifications, experience, time use, etc.
- Student test data: low stakes (survey)
  - We test 10 students from each focal grade (grades 1, 2 and 3), in all three focal subjects (Math, English and Swahili) and in Science.
  - Low stakes test administered by survey firm during normal school day.
- Student test data: high stakes (intervention)
  - All focal grade students are tested.
  - High stakes, used to calculate incentive pay.
  - Administered during special test day.
- Many impact studies of teacher incentive pay are based on high-stakes test data

Design validity

- No difference in baseline characteristics by
  - Students
  - School
  - Teachers
- No differential attrition *

English

- English was no longer taught in grades 1 and 2 in the second year of our study due to 3R (or 3K) program
- Many schools had already stopped teaching English in the first year of our study
- We included all English teachers in the first year but only 3rd grade English teachers in the second year
- During our study there was uncertainty about how to teach grade 3 English due to the curriculum changes
- Difficult to interpret results

Designing Teacher Performance Pay Programs

Test Scores - Low stakes

Table: Effect on Test Scores

	(1)	(2)	(3)	(4)	(5)	(6)
		Year 1			Year 2	
	Math	Swahili	English	Math	Swahili	English
Levels (α_1)	.038	.044	.014	.067*	.11***	.11
	(.047)	(.047)	(.086)	(.039)	(.039)	(.085)
P4Pctile (α_2)	-.017	-.035	-.049	.07*	.056	.19**
	(.04)	(.039)	(.076)	(.037)	(.035)	(.081)
N. of obs.	4,781	4,781	1,532	4,869	4,869	1,533
Gains-Levels $\alpha_3 = \alpha_2 - \alpha_1$	-.055	-.08*	-.063	.003	-.057	.079
p-value ($H_0 : \alpha_3 = 0$)	.21	.077	.41	.95	.16	.3

Test Scores - High stakes

Table: Effect on Test Scores

	(1)	(2)	(3)	(4)	(5)	(6)
		Year 1			Year 2	
	Math	Swahili	English	Math	Swahili	English
Levels (β_1)	.11**	.13***	.18***	.14***	.18***	.28***
	(.047)	(.048)	(.067)	(.045)	(.046)	(.069)
P4Pctile (β_2)	.066*	.017	.16***	.093**	.085*	.23***
	(.039)	(.043)	(.058)	(.04)	(.045)	(.055)
N. of obs.	48,077	48,077	14,664	59,680	59,680	15,458
Gains-Levels (β_3) $= \beta_2 - \beta_1$	-.047	-.11**	-.014	-.044	-.093**	-.047
p-value ($H_0 : \beta_3 = 0$)	0.30	0.026	0.83	0.31	0.045	0.53

▸ Difference

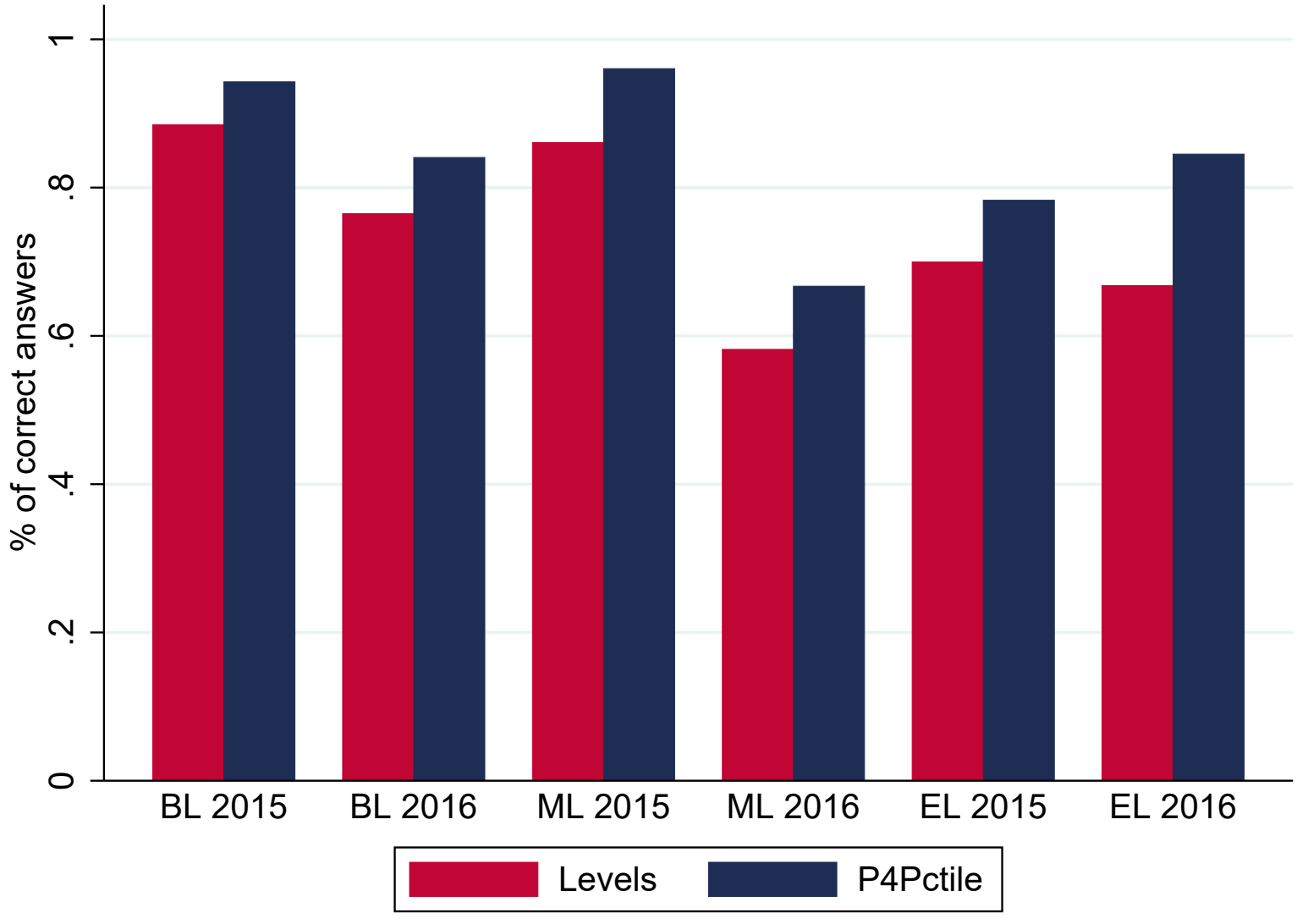
Science

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Grade 4						
	Year 1			Year 2		
	Math	Swahili	English	Math	Swahili	English
Levels (α_1)	.13**	.044	.17**	.061	.041	.082
	(.062)	(.05)	(.084)	(.063)	(.065)	(.069)
P4Pctile (α_2)	-.03	-.032	.032	-.0054	.026	.058
	(.054)	(.054)	(.077)	(.06)	(.061)	(.063)
N. of obs.	1,513	1,513	1,513	1,482	1,482	1,482
Gains-Levels $\alpha_3 = \alpha_2 - \alpha_1$	-.16**	-.077	-.14*	-.067	-.014	-.025
p-value ($H_0 : \alpha_3 = 0$)	.011	.13	.077	.25	.82	.72
Panel B: Science (Grades 1-3)						
	Year 1	Year 2				
Levels (α_1)	.069	.083				
	(.063)	(.06)				
P4Pctile (α_2)	-.005	.079				
	(.05)	(.057)				
N. of obs.	4,781	4,869				
Gains-Levels $\alpha_3 = \alpha_2 - \alpha_1$	-.074	-.0044				
p-value ($H_0 : \alpha_3 = 0$)	.24	.94				

Designing Teacher Performance Pay Programs

Designing Teacher Performance Pay Programs

Do teachers understand the intervention?



Teachers' earnings expectations

	Bonus (TZS) (1)	Bottom of the district (2)	Middle of the district (3)	Top of the district (4)	Worried low bonus (5)
P4Pctile (α_2)	-94,330**	-.029	-.0092	.035	-.02
	(37,169)	(.03)	(.059)	(.045)	(.026)
N. of obs.	653	676	676	676	676
Mean Levels	525,641	.086	.48	.8	.074

Designing Teacher Performance Pay Programs

Do we observe a change in teacher behavior?

Table: Teacher Behavioral Responses - Spot checks

	(1)	(2)	(3)	(4)
	Year 1		Year 2	
	In school	In classroom	In school	In classroom
Levels (α_1)	0.012	0.0061	-0.025	0.025
	(0.053)	(0.057)	(0.050)	(0.053)
P4Pctile (α_2)	-0.012	-0.023	-0.0050	0.023
	(0.044)	(0.050)	(0.044)	(0.044)
N. of obs.	180	180	180	180
Mean control	.71	.32	.67	.37
Gains-Levels $\alpha_3 = \alpha_2 - \alpha_1$	-.024	-.029	.02	-.0021
p-value ($H_0 : \alpha_3 = 0$)	.65	.6	.71	.97

Do we observe a change in teacher behavior?

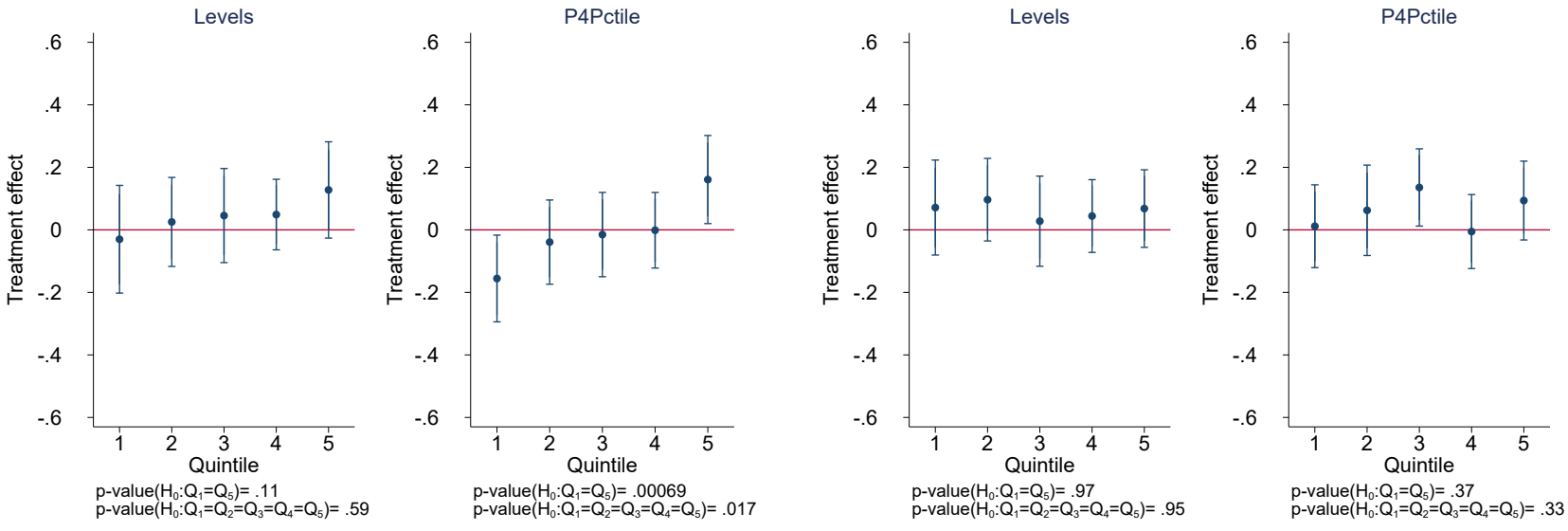
Table: Teacher Behavioral Responses - Student reports

	(1)	(2)	(3)	(4)
	Year 1		Year 2	
	Extra help	Homework	Extra help	Homework
Levels (α_1)	0.011	0.033	0.0052	0.0029
	(0.018)	(0.024)	(0.0096)	(0.018)
P4Pctile (α_2)	-0.022	-0.0055	0.016*	-0.023
	(0.017)	(0.024)	(0.0097)	(0.019)
N. of obs.	9,006	9,006	9,557	9,557
Mean control	.12	.1	.018	.093
Gains-Levels $\alpha_3 = \alpha_2 - \alpha_1$	-.034*	-.038	.011	-.026
p-value ($H_0 : \alpha_3 = 0$)	.073	.16	.29	.24

Designing Teacher Performance Pay Programs

Heterogeneity baseline ability - Math

Figure: Math

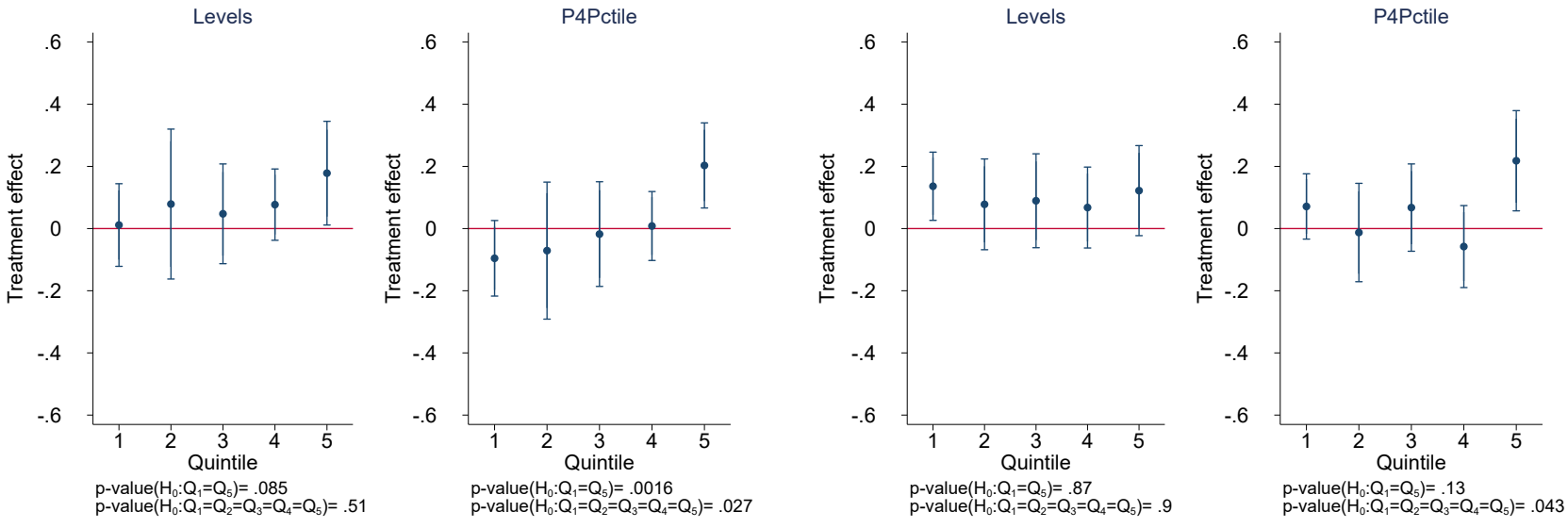


: Year 1

: Year 2

Heterogeneity baseline ability - Swahili

Figure: Swahili



: Year 1

: Year 2

Designing Teacher Performance Pay Programs

Goal posting

	Goals				Twaweza test goals	
	School exam	Twaweza exam	Student learning	Own knowledge	General	Specific (number)
	(1)	(2)	(3)	(4)	(5)	(6)
Levels (α_1)	-.02	.076**	-.088**	-.097**	.067**	.095*
	(.053)	(.029)	(.04)	(.037)	(.031)	(.052)
P4Pctile (α_2)	-.047	.025	-.077*	-.066*	.076***	.036
	(.048)	(.027)	(.042)	(.037)	(.022)	(.042)
N. of obs.	1,016	1,016	1,016	1,016	1,016	1,016
Mean control	.46	.078	.34	.25	.89	.19
$\alpha_3 = \alpha_2 - \alpha_1$	-.027	-.05	.011	.031	.0094	-.059
p-value($\alpha_3 = 0$)	.58	.14	.78	.42	.7	.27

Designing Teacher Performance Pay Programs

Heterogeneity baseline ability - Swahili

	(1)	(2)	(3)	(4)	(5)
Panel A: Math					
	Male	Age	IRT	HT Rating	Self Ratir
Levels*Covariate (α_2)	0.033	0.00080	0.016	0.073***	0.041
	(0.070)	(0.0016)	(0.037)	(0.021)	(0.035)
P4Pctile*Covariate (α_1)	-0.017	0.00056	-0.025	0.012	0.058*
	(0.060)	(0.0016)	(0.038)	(0.022)	(0.035)
N. of obs.	9,650	9,650	9,650	4,869	9,650
$\alpha_3 = \alpha_2 - \alpha_1$	-.05	-.00024	-.041	-.062**	.017
p-value ($H_0 : \alpha_3 = 0$)	.49	.88	.2	.012	.61
Panel B: Swahili					
	Male	Age	IRT	HT Rating	Self Ratir
Levels*Covariate (α_2)	-0.081	-0.0000038	0.0022	0.069**	0.085**
	(0.069)	(0.0011)	(0.034)	(0.031)	(0.034)
P4Pctile*Covariate (α_1)	0.013	0.000058	0.0053	0.051	0.076**
	(0.067)	(0.0011)	(0.030)	(0.034)	(0.032)
N. of obs.	9,650	9,650	9,650	4,869	9,650
$\alpha_3 = \alpha_2 - \alpha_1$	.094	.000062	.0031	-.019	-.0092
p-value ($H_0 : \alpha_3 = 0$)	.19	.95	.93	.56	.8

Designing Teacher Performance Pay Programs

Help from other teachers

	Help from other teachers (# last month) (1)	Help/advice from other teachers (very good/good) (2)	Help/advice from head teacher (very good/good) (3)
Levels (α_1)	-.32**	-.058*	-.025
	(.15)	(.031)	(.031)
P4Pctile (α_2)	-.42**	-.0015	.026
	(.18)	(.026)	(.026)
N. of obs.	1,991	1,998	1,940
Mean control	1.3	.75	.78
$\alpha_3 = \alpha_2 - \alpha_1$	-.094	.057*	.05
p-value($\alpha_3 = 0$)	.5	.081	.14

Designing Teacher Performance Pay Programs

Conclusions

- Despite theoretical advantage of the pay for percentile system, we find that the simpler multiple threshold system delivers results that are at least as good, and sometimes better.
- Contrary to (naive) predictions, teachers seem to focus on top students in both systems.
- Overall estimated impacts were small to modest, perhaps due to other constraints that were not addressed (lack of inputs?)
- Stay tuned for more analysis....

Thank you

- Herzlichen Dank
- Gracias
- Asante Sana
- Merci
- Obrigado
- Grazie

Bibliography I

Balch, R., & Springer, M. G. (2015). Performance pay, test scores, and student learning objectives. *Economics of Education Review*, *44*(0), 114 - 125. Retrieved from http://www.sciencedirect.com/science/article/pii/S0272775714001034 doi: http://dx.doi.org/10.1016/j.econedurev.2014.11.002

Barlevy, G., & Neal, D. (2012). Pay for percentile. *American Economic Review*, *102*(5), 1805-31. Retrieved from http://www.aeaweb.org/articles.php?doi=10.1257/aer.102.5.1805 doi: 10.1257/aer.102.5.1805

Bettinger, E., & Long, B. (2004). Do college instructors matter? the effects of adjuncts on students interests and success. *Review of Economics and Statistics*, *92*(3).

Bibliography II

Glewwe, P., Ilias, N., & Kremer, M. (2010). Teacher incentives. *American Economic Journal: Applied Economics*, *2*(3), 205-27. Retrieved from http://www.aeaweb.org/articles.php?doi=10.1257/app.2.3.205 doi: 10.1257/app.2.3.205

Goldhaber, D., & Walch, J. (2012). Strategic pay reform: A student outcomes-based evaluation of Denver's procomp teacher pay initiative. *Economics of Education Review*, *31*(6), 1067 - 1083. Retrieved from http://www.sciencedirect.com/science/article/pii/S0272775712000751 doi: http://dx.doi.org/10.1016/j.econedurev.2012.06.007

Bibliography III

Goodman, S. F., & Turner, L. J. (2013). The Design of Teacher Incentive Pay and Educational Outcomes: Evidence from the New York City Bonus Program. *Journal of Labor Economics*, *31*(2), 409 - 420. Retrieved from http://ideas.repec.org/a/ucp/jlabec/doi10.1086-668676.html

Kane, T. J., Rockoff, J. E., & Staiger, D. O. (2008, December). What does certification tell us about teacher effectiveness? evidence from new york city. *Economics of Education Review*, *27*(6), 615-631. Retrieved from http://ideas.repec.org/a/eee/ecoedu/v27y2008i6p615-631.html

Lavy, V. (2002). Evaluating the effect of teachers' group performance incentives on pupil achievement. *Journal of Political Economy*, *110*(6), pp. 1286-1317. Retrieved from http://www.jstor.org/stable/10.1086/342810

Bibliography IV

Lavy, V. (2009). Performance pay and teachers' effort, productivity, and grading ethics. *American Economic Review*, *99*(5), 1979-2011. Retrieved from http://www.aeaweb.org/articles.php?doi=10.1257/aer.99.5.1979 doi: 10.1257/aer.99.5.1979

Muralidharan, K., & Sundararaman, V. (2011). Teacher performance pay: Experimental evidence from india. *Journal of Political Economy*, *119*(1), pp. 39-77. Retrieved from http://www.jstor.org/stable/10.1086/659655

Springer, M. G., Ballou, D., Hamilton, L., Le, V.-N., Lockwood, J., McCaffrey, D. F., ... Stecher, B. M. (2011). Teacher pay for performance: Experimental evidence from the project on incentives in teaching (point). *Society for Research on Educational Effectiveness*.

Bibliography V

Woessmann, L. (2011). Cross-country evidence on teacher performance pay. *Economics of Education Review*, *30*(3), 404 - 418. Retrieved from http://www.sciencedirect.com/science/article/pii/S0272775710001731 doi: http://dx.doi.org/10.1016/j.econedurev.2010.12.008

Designing Teacher Performance Pay Programs

References

Extra slides

Baseline descriptive/balance: students

Table: Summary statistics across treatment groups at baseline (February 2015)

	(1) Control	(2) Gains	(3) Levels	(4) p-value (all equal)
Age	8.88	8.94	8.89	0.35
	(1.60)	(1.67)	(1.60)	
Male	0.50	0.48	0.51	0.05*
	(0.50)	(0.50)	(0.50)	
Kiswahili test score	-0.00	0.01	0.01	0.14
	(1.00)	(0.99)	(0.98)	
English test score	0.00	0.04	-0.02	0.71
	(1.00)	(1.03)	(1.04)	
Math test score	-0.00	-0.01	-0.01	0.56
	(1.00)	(1.04)	(1.00)	
Tested in yr0	0.91	0.89	0.90	0.41
	(0.29)	(0.31)	(0.30)	

Baseline descriptive/balance: schools and households

Table: Summary statistics across treatment groups at baseline (February 2015)

	(1) Control	(2) Gains	(3) Levels	(4) p-value (all eq
Total enrollment	643.42	656.35	738.37	0.67
	(331.22)	(437.74)	(553.33)	
Facilities index (PCA)	0.18	-0.11	-0.24	0.07*
	(1.23)	(0.97)	(1.01)	
Urban	0.15	0.13	0.17	0.92
	(0.36)	(0.34)	(0.38)	
Single shift	0.63	0.62	0.62	0.95
	(0.49)	(0.49)	(0.49)	

Back

Baseline descriptive/balance: teachers

Table: Summary statistics across treatment groups at baseline (February 2015)

	(1) Control	(2) Gains	(3) Levels	(4) p-value (all eq
Male	0.42	0.38	0.35	0.19
	(0.49)	(0.49)	(0.48)	
Age (Yrs)	37.89	37.02	37.70	0.18
	(11.35)	(11.23)	(11.02)	
Experience (Yrs)	13.97	12.91	13.54	0.11
	(11.93)	(11.47)	(11.14)	
Private school experience	0.03	0.01	0.03	0.05*
	(0.17)	(0.11)	(0.17)	
Tertiary education	0.87	0.88	0.87	0.74
	(0.33)	(0.32)	(0.33)	

Back

Test Scores

	(1)	(2)	(3)	(4)	(5)	(6)
		Year 1			Year 2	
	Math	Swahili	English	Math	Swahili	English
$\beta_1 - \alpha_1$	.065	.075	.14	.063	.056	.15
p-value($\beta_1 - \alpha_1 = 0$)	.13	.097	.12	.11	.2	.14
$\beta_2 - \alpha_2$	.078	.046	.2	.021	.025	.041
p-value($\beta_2 - \alpha_2 = 0$)	.072	.29	.017	.6	.55	.64
$\beta_3 - \alpha_3$	.012	-.029	.056	-.042	-.031	-.11
p-value($\beta_3 - \alpha_3 = 0$)	.78	.53	.52	.3	.51	.28

Back

Design

Table:

		Current treatment			
		Levels	Gains	Control	Total
Previous RCT	C1	40	20	10	70
	C2	10	30	30	70
	C3	10	10	20	40
	Total	60	60	60	180

Back