



Higher School of Economics

Center for Institutional Studies

Social comparison, incentives and motives to learn: a field experiment in Uganda

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Predictions

- Social comparison theory
 - It is important to know the relative standing to correctly exert effort
 - Festinger (1954)
 - Experiments on feedback provision
 - Azmat & Irriberi (2010, 2014), Azmat et al. (2015), Andrabi et al. (2009), Erickson et al. (2009), Bandiera et al (2011), etc.
- Incentives
 - Financial rewards
 - Angrist et al. (2004), Kremer et al. (2002), Blimpo (2014), etc.
 - Reputation/Symbolic/Status rewards
 - Kosfeld & Neckerman (2011), etc.
- What if we have group outcomes?

Research questions

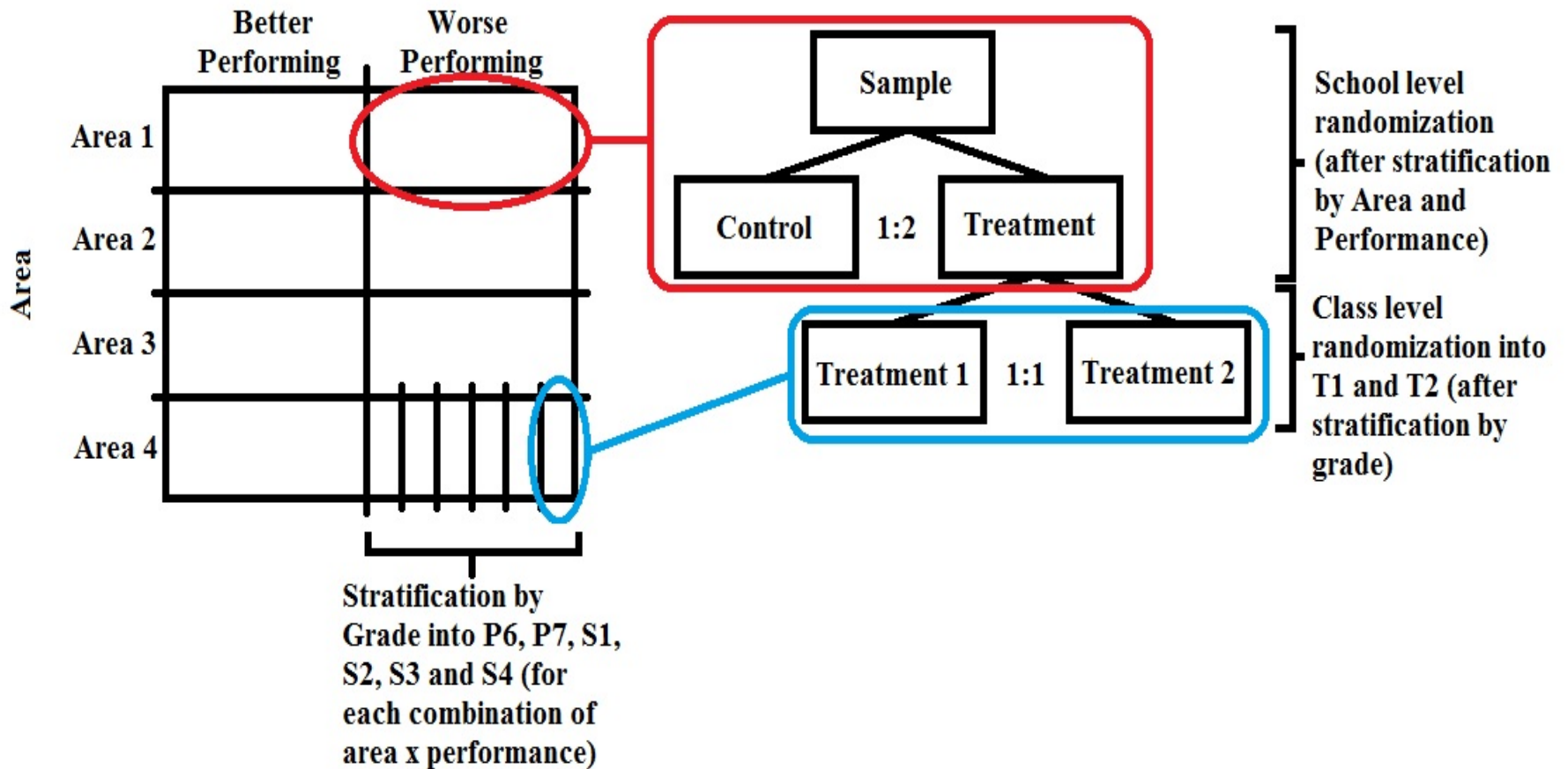
- Can feedback motivate students to improve their performance?
- How do rewards (financial and reputational) influence students' motivation?
 - What role does the information play if rewards are introduced?
 - Is it important to correctly know my relative standing?
- The effect of incentives on attrition?
- Heterogeneity of the results?
 - by gender, age, school level, area, group composition
- What are the effects on other than learning outcomes?
 - Stress, happiness, aspirations, effort and (over)confidence

Randomized Control Trial

STRATIFICATION

RANDOMIZATION

Performance



Treatment and Control groups

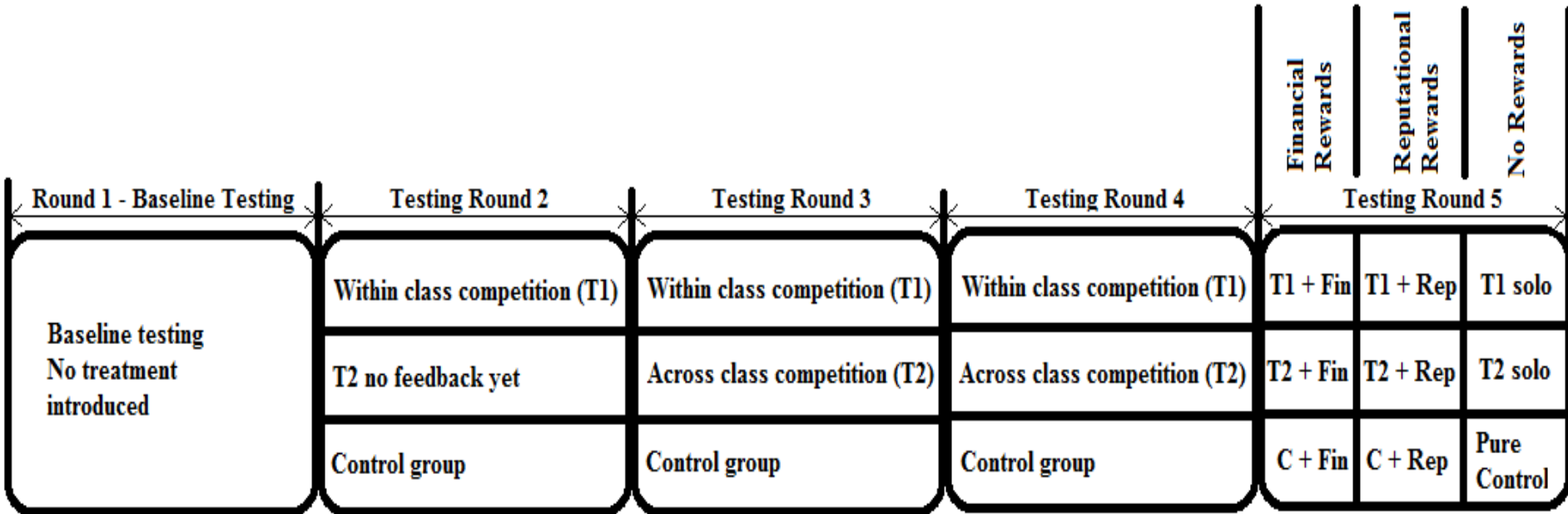
- Treatment 1
 - Within class comparison of group outcomes based on group average score in Math and English
 - Small groups of 3-4 students randomly chosen
- Treatment 2
 - Across class comparison of group outcomes based on overall class average score in Math and English
- Control
 - No feedback

Treatment and Control groups

Orthogonal treatments

- Financial rewards
 - 2000 UGX to students whose group score was among 15% best performing or 15% best improving
- Reputation rewards
 - Names of the 15% best performing or 15% most improving groups published at local newspapers Bukedde
- No rewards
 - No incentivization

Timeline and final sample



- More than 5000 students repeatedly tested and interviewed
- Primary (P6 and P7) and secondary schools (S1, S2, S3 and S4) in Southern Uganda

Results

- Randomization successfully divided sample into on-average-the-same treatment and control groups
- (Non)random attrition?
 - More people drop from the control than treatment group
 - People who stay in the sample, however, are on average the same in terms of observables
 - Sort-of-random attrition
 - If true, alternative estimation methods deliver similar results

Attrition

Table 12: TREATMENT EFFECTS ON PROBABILITIES OF STUDENTS' ATTENDANCES

Overall treatment effects on:	Attrition	Alwayscomer
Within class social comparison (T1)	-0.088*** (0.028)	0.120*** (0.035)
Across class social comparison (T2)	-0.111*** (0.026)	0.108*** (0.032)
Financial Rewards (Fin)	-0.122*** (0.029)	0.124*** (0.038)
Reputational Rewards (Rep)	-0.126*** (0.035)	0.034 (0.043)
Controlled for stratas	Yes	Yes
N	7109	7109

Note: Robust standard errors adjusted for clustering at class level are in parentheses. Controlled for stratum fixed effects - area (four different areas), school performance at national examination and grade level (P6,P7, S1 up to S4). N stands for the number of observations.

* significant at 10%; ** significant at 5%; *** significant at 1%

Attrited students, by T/C group

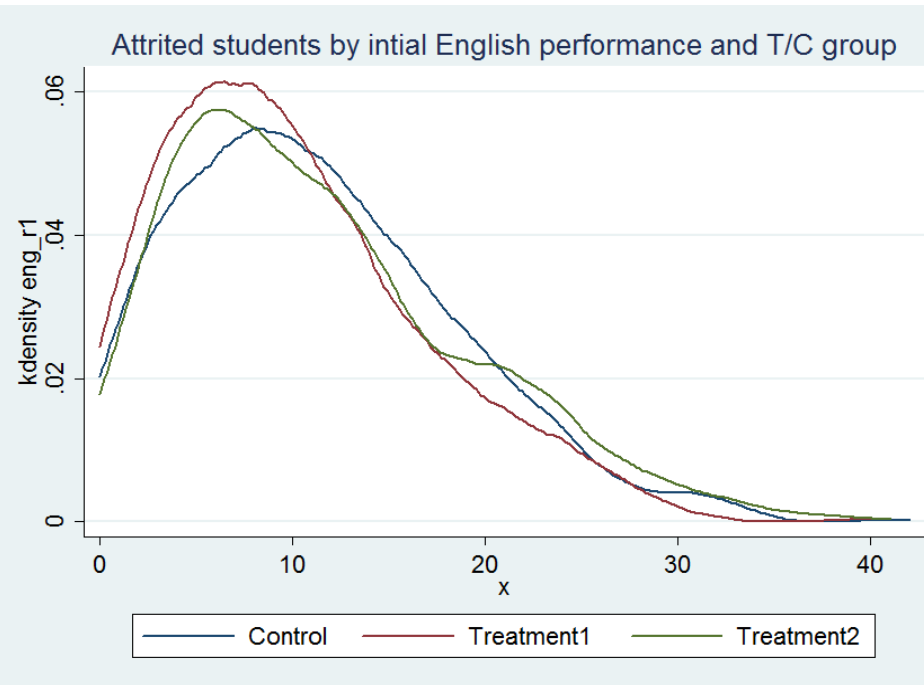
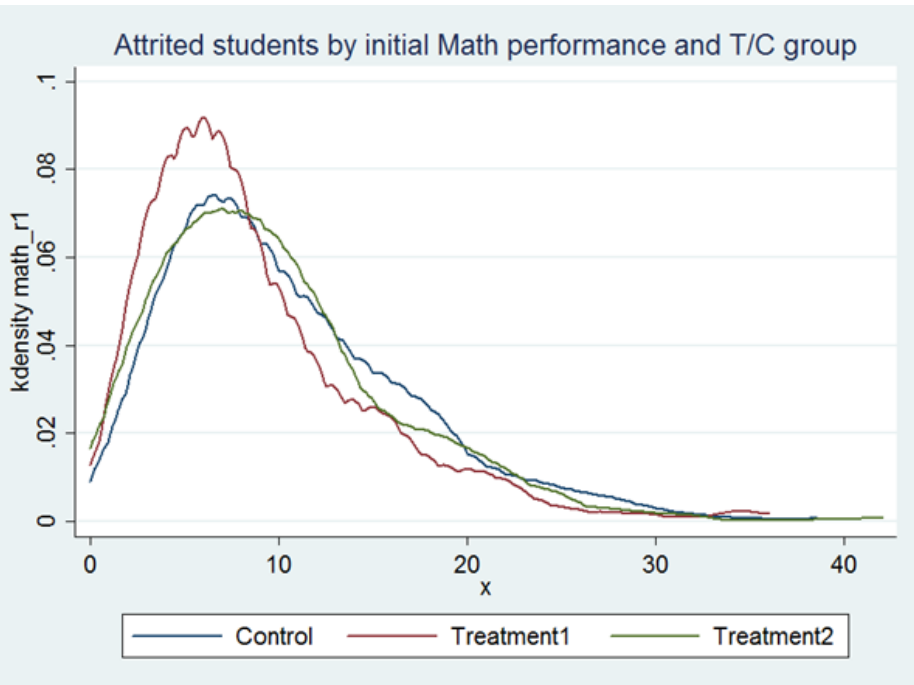
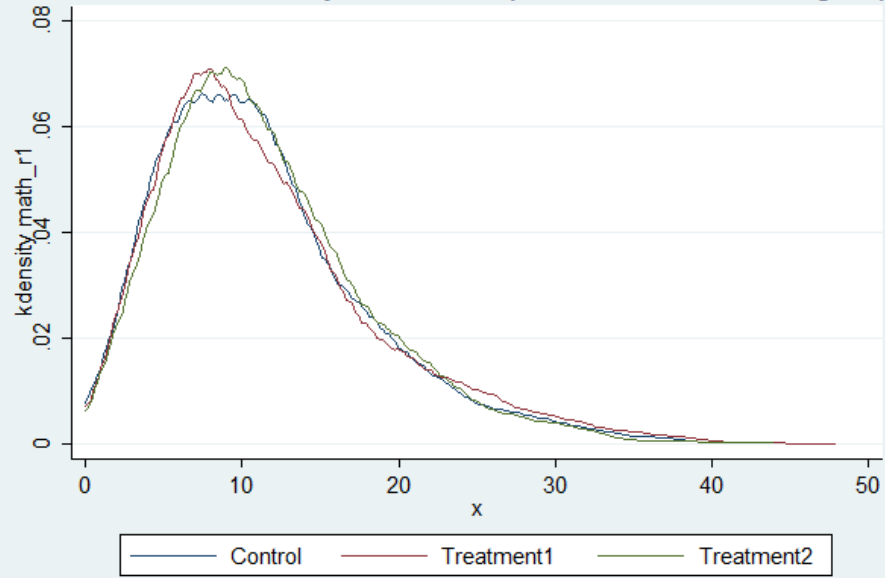


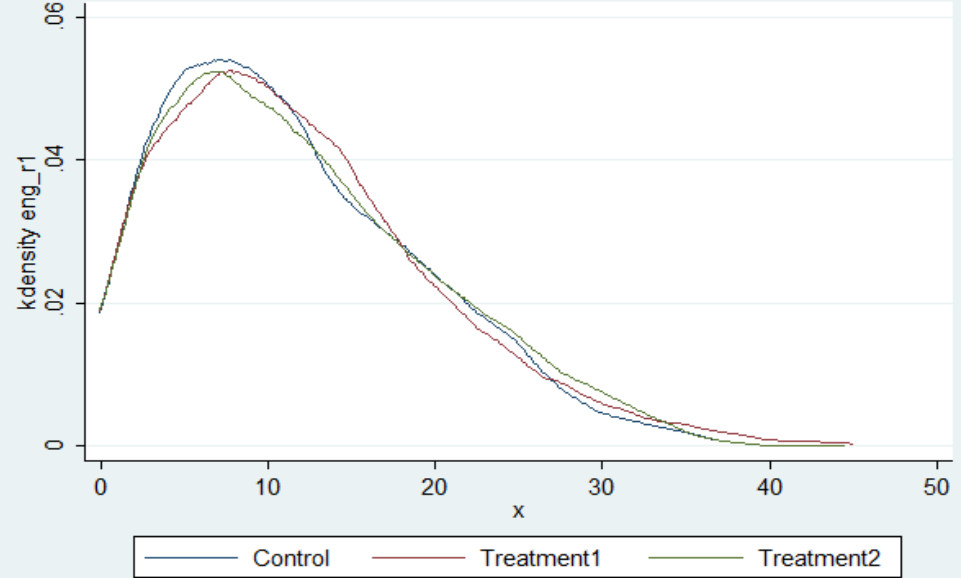
Table 1: Testing of differences in distributions of students who attrited and students who stayed, by T/C group
Ksmirnov test on equality of distributions, p-values presented

	Baseline differences		Students who attrited		Students who stayed		Alwayspresent students	
	(T1 - C)	(T2 - C)	(T1 - C)	(T2 - C)	(T1 - C)	(T2 - C)	(T1 - C)	(T2 - C)
STUDENTS PERFORMANCE - ROUND 1 - BASELINE SURVEY								
Mathematics	0.123	0.274	0.000	0.158	0.752	0.192	0.677	0.958
English	0.952	0.168	0.003	0.546	0.230	0.282	0.211	0.840

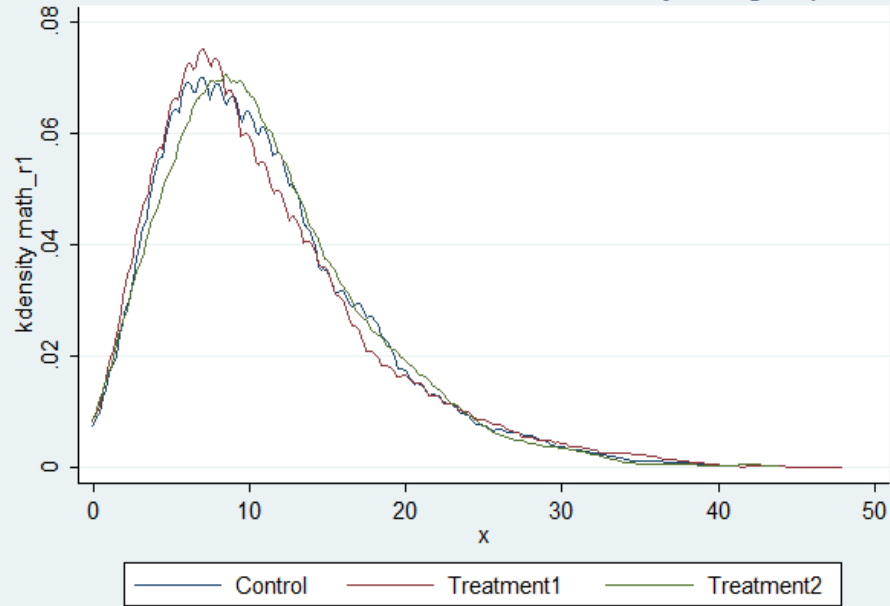
Present students by initial Math performance and T/C group



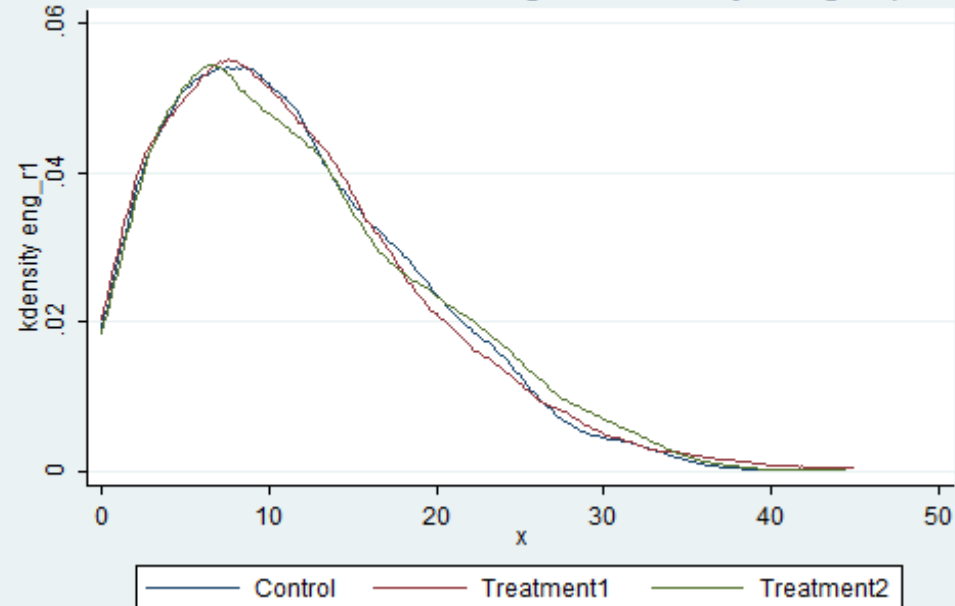
Present students by initial English performance and T/C group



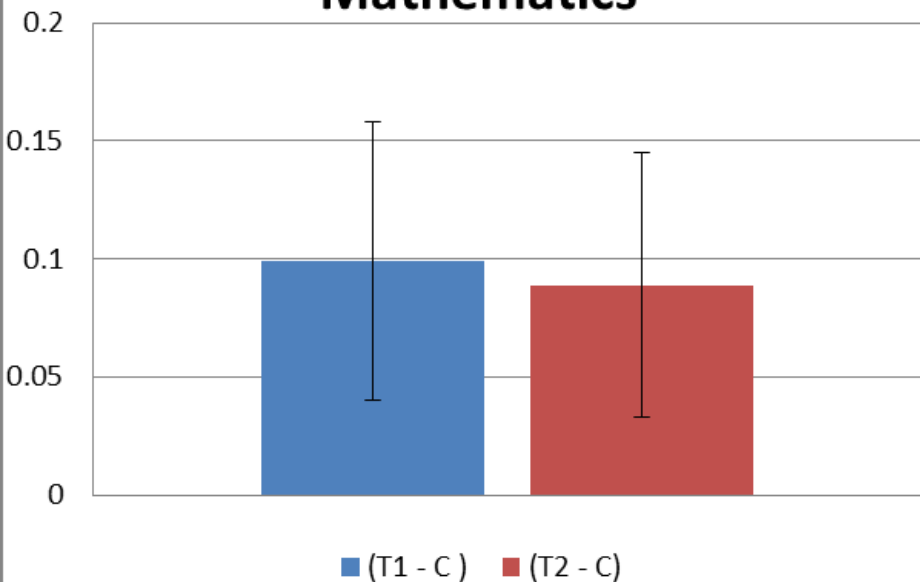
Distributions of baseline Math score by T/C groups



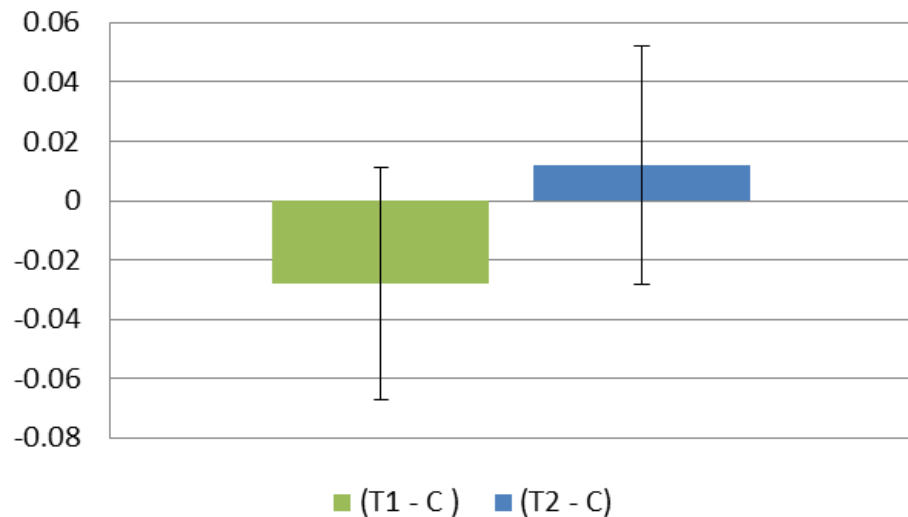
Distributions of baseline English scores by T/C groups



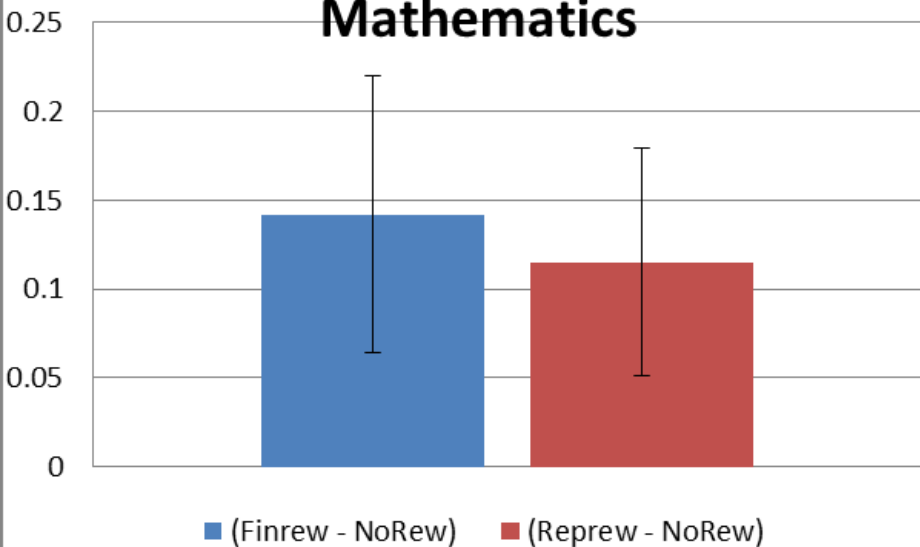
The effects of feedback on Mathematics



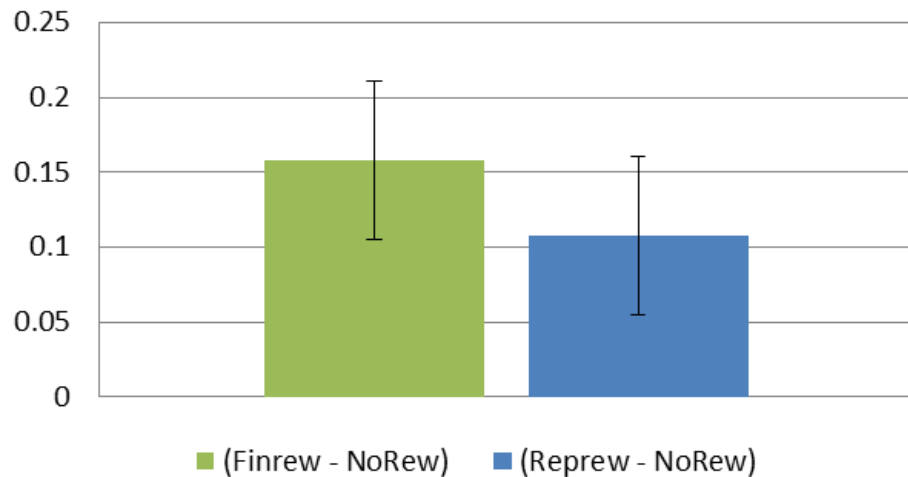
The effects of feedback on English



The effects of rewards on Mathematics



The effects of rewards on English



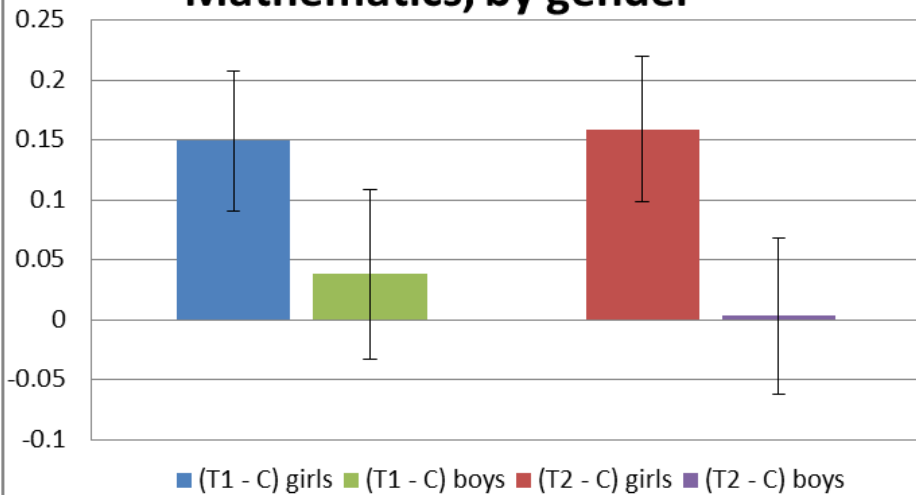
Results

Dependent variable: Math and English score	Mathematics	English
<hr/> A. OVERALL EFFECTS OF TREATMENTS <hr/>		
Within class social comparison (Treatment 1)	0.099* (0.059)	-0.028 (0.039)
Across class social comparison (Treatment 2)	0.089[§] (0.056)	0.012 (0.040)
Financial Rewards	0.142* (0.078)	0.158** (0.053)
Reputational Rewards	0.115* (0.064)	0.108** (0.053)
Controlled for stratas	Yes	Yes
Interactions	No	No
N	5102	5093

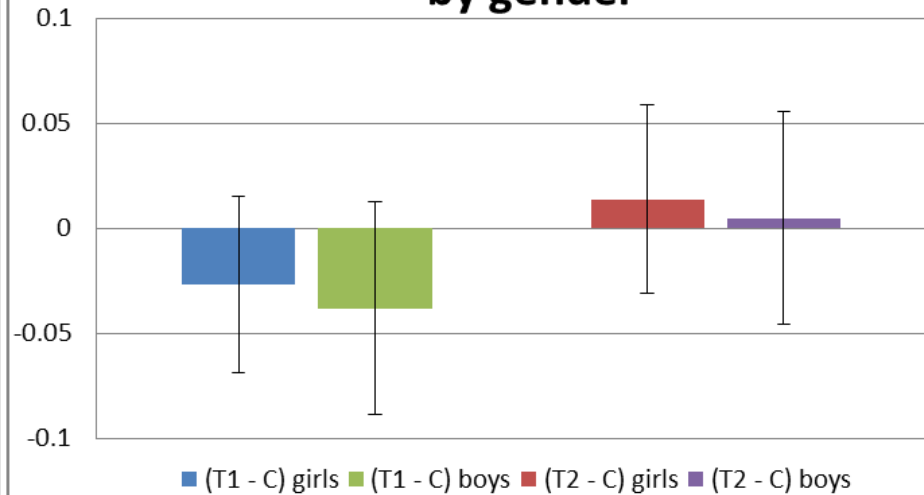
What drives the results?

	Mathematics	English
A. INTERACTION OF THE TREATMENTS		
Pure within class social comparison (T1_SOLO)	0.100 (0.084)	-0.128** (0.056)
Pure across class social comparison (T2_SOLO)	0.082 (0.074)	-0.049 (0.059)
Pure inancial Rewards (Fin_SOLO)	0.106 (0.101)	0.045 (0.088)
Pure reputational Rewards (Rep_SOLO)	0.138 (0.141)	0.016 (0.082)
Within class comparison with financial reward (T1_fin)	0.231* (0.118)	0.103 (0.094)
Within class social comparison with reputational reward (T1_rep)	0.209** (0.103)	0.087 (0.080)
Across class social comparison with financial reward (T2_fin)	0.277** (0.139)	0.173* (0.094)
Across class social comparison with reputational reward (T2_rep)	0.188** (0.080)	0.047 (0.080)
Baseline Math/English score	0.729*** (0.017)	0.737*** (0.016)
Controlled for stratas	Yes	Yes
N	5102	5093

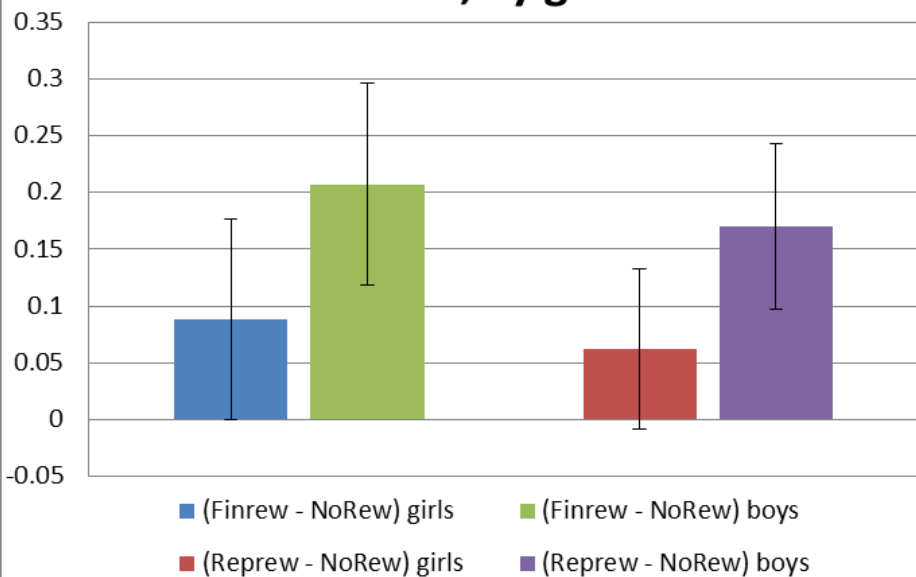
The effects of feedback on Mathematics, by gender



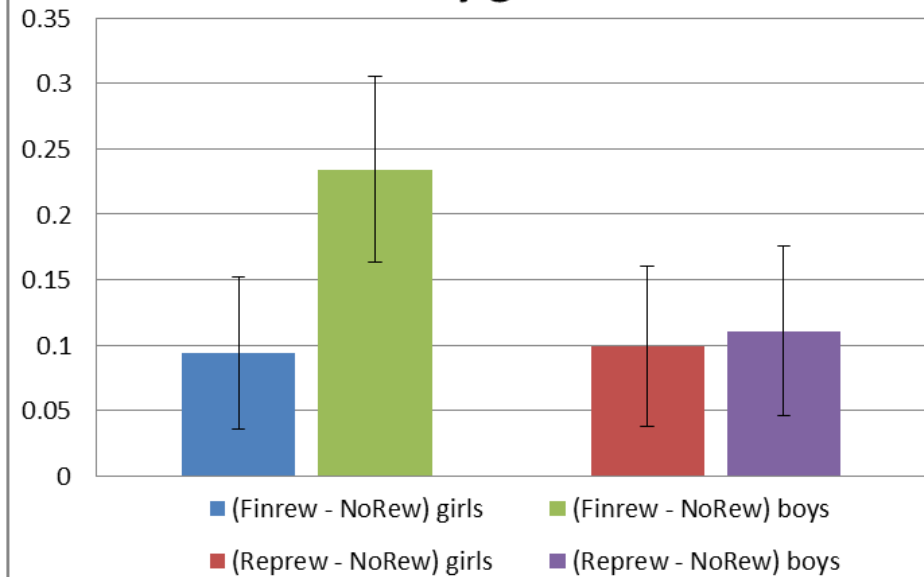
The effects of feedback on English, by gender



The effects of feedback on Mathematics, by gender



The effects of feedback on English, by gender



Results

	Mathematics		English	
	Girls	Boys	Girls	Boys
OVERALL EFFECTS OF TREATMENTS				
Within class social comparison (Treatment 1)	0.149** (0.058)	0.038 (0.071)	-0.027 (0.042)	-0.038 (0.051)
Across class social comparison (Treatment 2)	0.159*** (0.061)	0.003 (0.065)	0.014 (0.045)	0.005 (0.051)
Financial Rewards	0.088 (0.088)	0.207** (0.089)	0.094 (0.068)	0.234*** (0.078)
Reputational Rewards	0.062 (0.071)	0.170** (0.073)	0.099* (0.056)	0.111* (0.067)
Controlled for stratas	Yes	Yes	Yes	Yes
N	2858	2207	2858	2207

Results

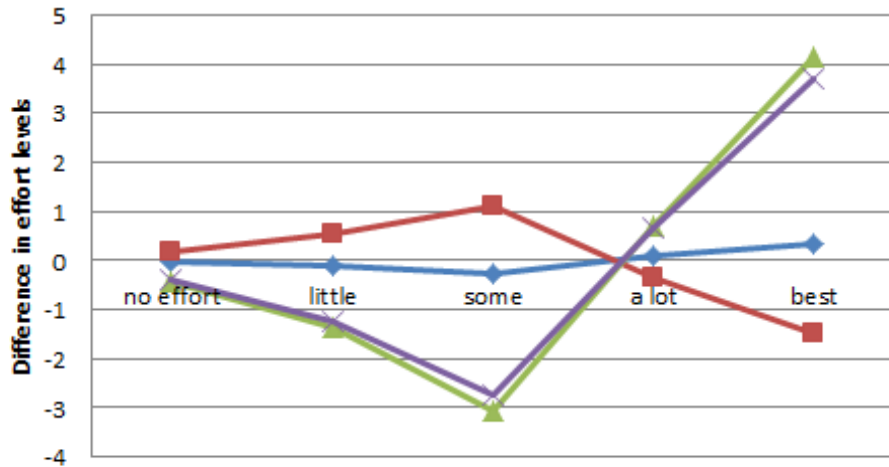
Dependent variable: Math or English score	MATHEMATICS		ENGLISH	
	Girls	Boys	Girls	Boys
INTERACTION OF THE TREATMENTS				
Within class social comparison (T1_solo)	0.121[§] (0.080)	0.076 (0.107)	-0.141** (0.059)	-0.116[§] (0.072)
Across class social comparison (T2_solo)	0.135* (0.077)	0.009 (0.088)	-0.076 (0.066)	-0.019 (0.072)
Financial Rewards (Fin_solo)	0.018 (0.103)	0.208* (0.125)	-0.038 (0.096)	0.139 (0.111)
Reputational Rewards (Rep_solo)	0.059 (0.189)	0.218 (0.210)	-0.039 (0.087)	0.079 (0.106)
Within class comparison financial reward (T1_fin)	0.229* (0.117)	0.228[§] (0.139)	0.016 (0.092)	0.198* (0.116)
Within class social comparison reputational reward (T1_rep)	0.201** (0.101)	0.204[§] (0.131)	0.069 (0.088)	0.092 (0.094)
Across class social comparison financial reward (T2_fin)	0.275* (0.159)	0.284[§] (0.175)	0.108 (0.101)	0.249** (0.112)
Across class social comparison reputational reward (T2_rep)	0.189** (0.091)	0.175* (0.104)	0.041 (0.083)	0.042 (0.103)

Value added of interactions

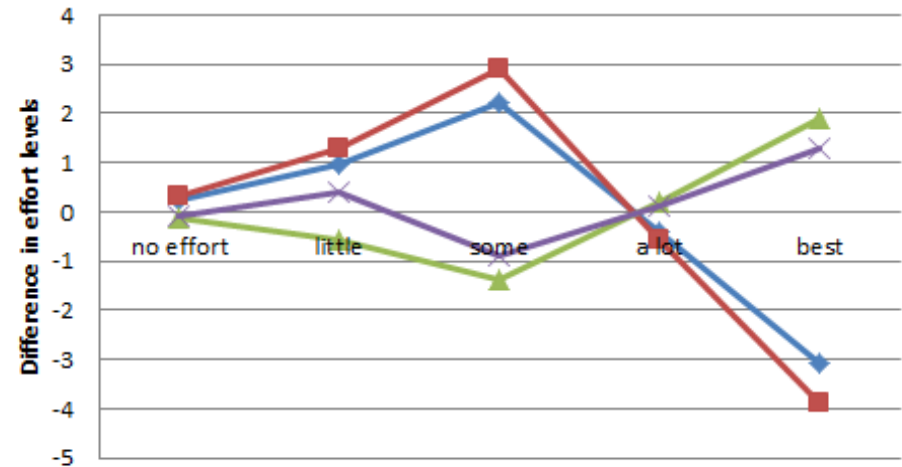
Dependent variable: Math or English score	MATHEMATICS							
	Girls	Boys	GIRLS		t1_fin	t1_rep	t2_fin	t2_rep
INTERACTION OF THE TREATMENTS								
Within class social comparison (T1_solo)	0.121[§] (0.080)	0.076 (0.107)	t1_solo	diff	0.107	0.080		
				p-value	0.336	0.388		
Across class social comparison (T2_solo)	0.135* (0.077)	0.009 (0.088)	t2_solo	diff			0.140	0.054
				p-value			0.362	0.509
Financial Rewards (Fin_solo)	0.018 (0.103)	0.208* (0.125)	fin_solo	diff	0.210		0.257	
				p-value	0.039		0.079	
Reputational Rewards (Rep_solo)	0.059 (0.189)	0.218 (0.210)	rep_solo	diff		0.142		0.129
				p-value		0.293		0.334
			BOYS		t1_fin	t1_rep	t2_fin	t2_rep
Within class comparison financial reward (T1_fin)	0.229* (0.117)	0.228[§] (0.139)	t1_solo	diff	0.152	0.127		
				p-value	0.251	0.287		
Within class social comparison reputational reward (T1_rep)	0.201** (0.101)	0.204[§] (0.131)	t2_solo	diff			0.274	0.166
				p-value			0.08	0.027
Across class social comparison financial reward (T2_fin)	0.275* (0.159)	0.284[§] (0.175)	fin_solo	diff	0.020		0.077	
				p-value	0.860		0.638	
Across class social comparison reputational reward (T2_rep)	0.189** (0.091)	0.175* (0.104)	rep_solo	diff		0.015		0.043
				p-value		0.922		0.742

Math versus English

Treatment effects on effort level,
Mathematics



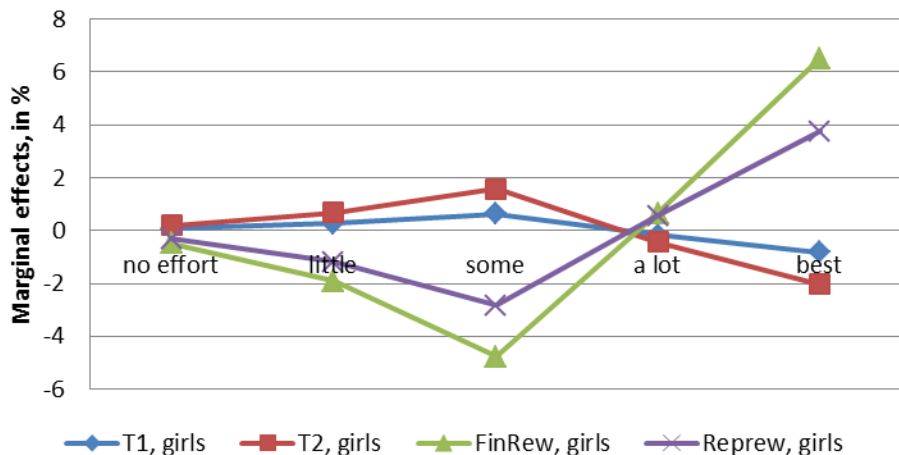
Treatment effects on effort level,
English



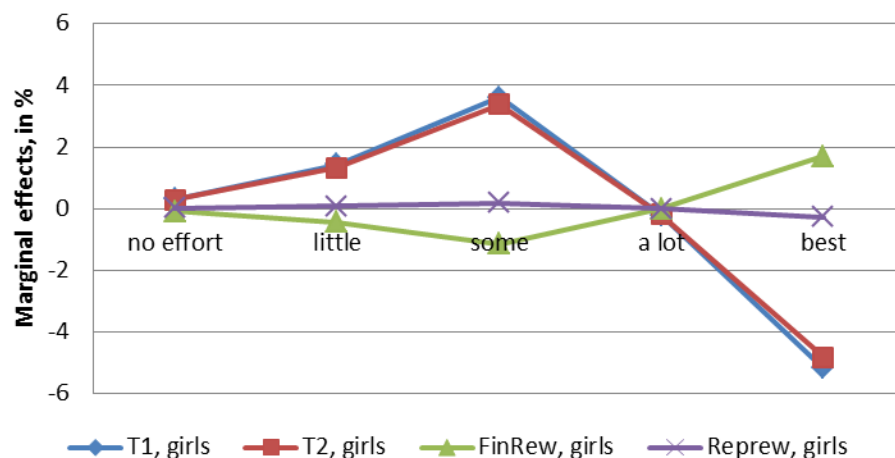
— Treatment 1 — Treatment 2 — Financial Rewards — Reputation rewards

- Order effect vs. Natural behavior
- Effect driven by girls, boys no change in effort

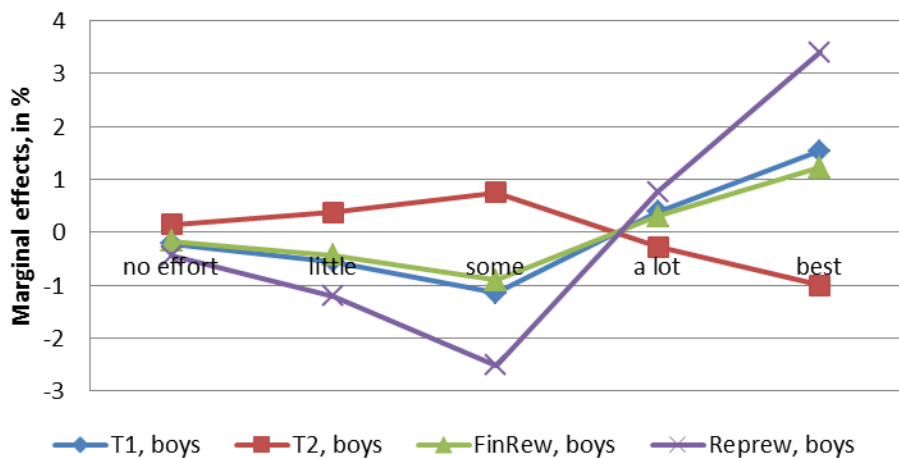
Effort level by Girls in Math



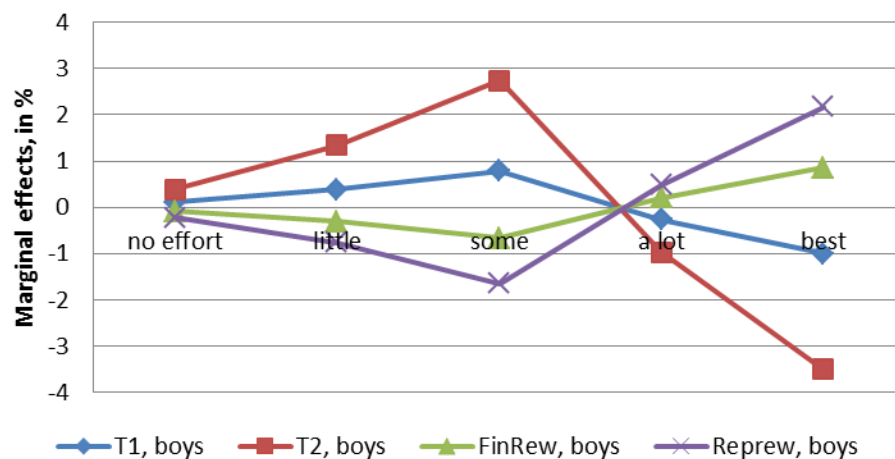
Effort level by Girls in English



Effort level by Boys in Math

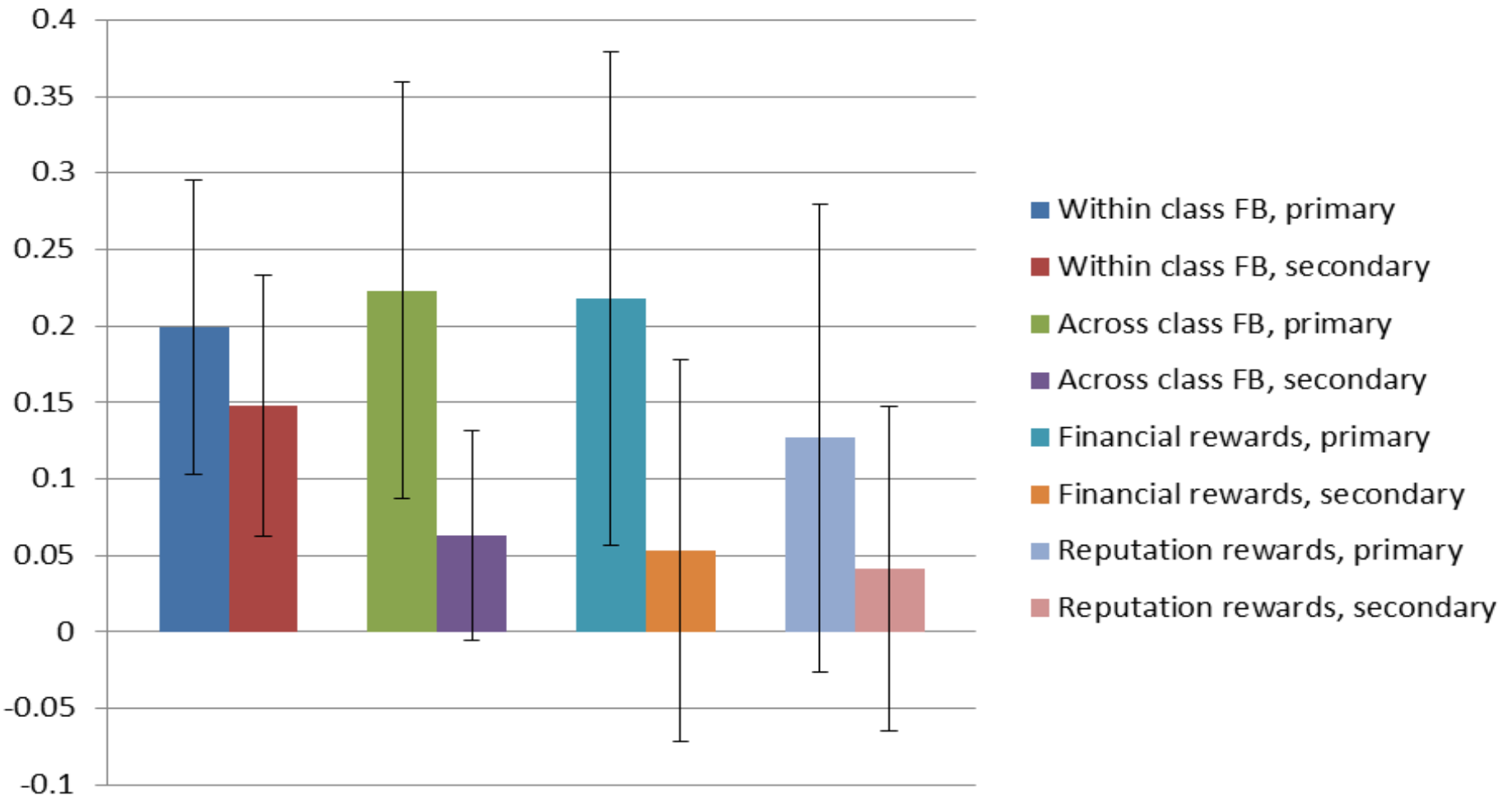


Effort level by Boys in English



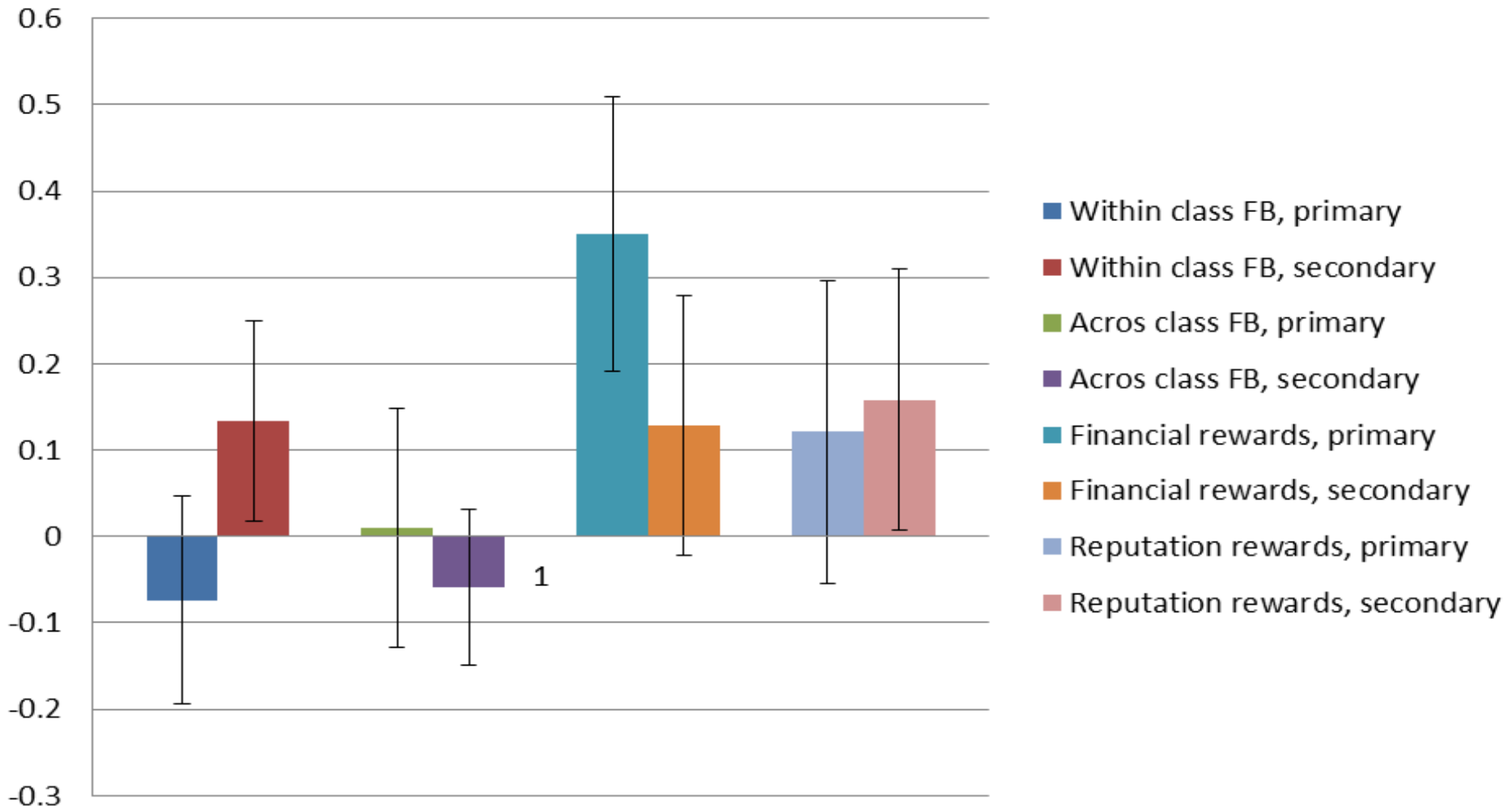
Results by school level

Treatment effects for girls, by school level



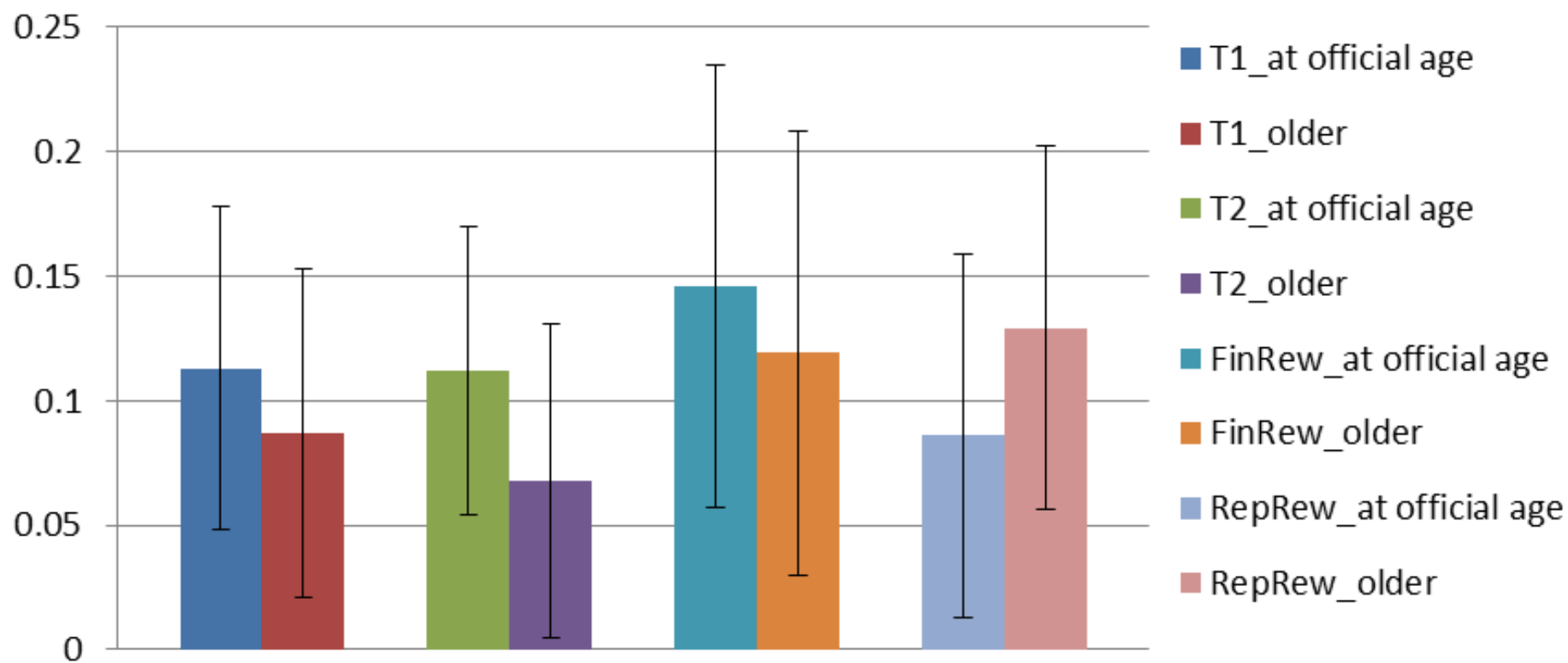
Results by school level

Treatment effects for boys, by school level



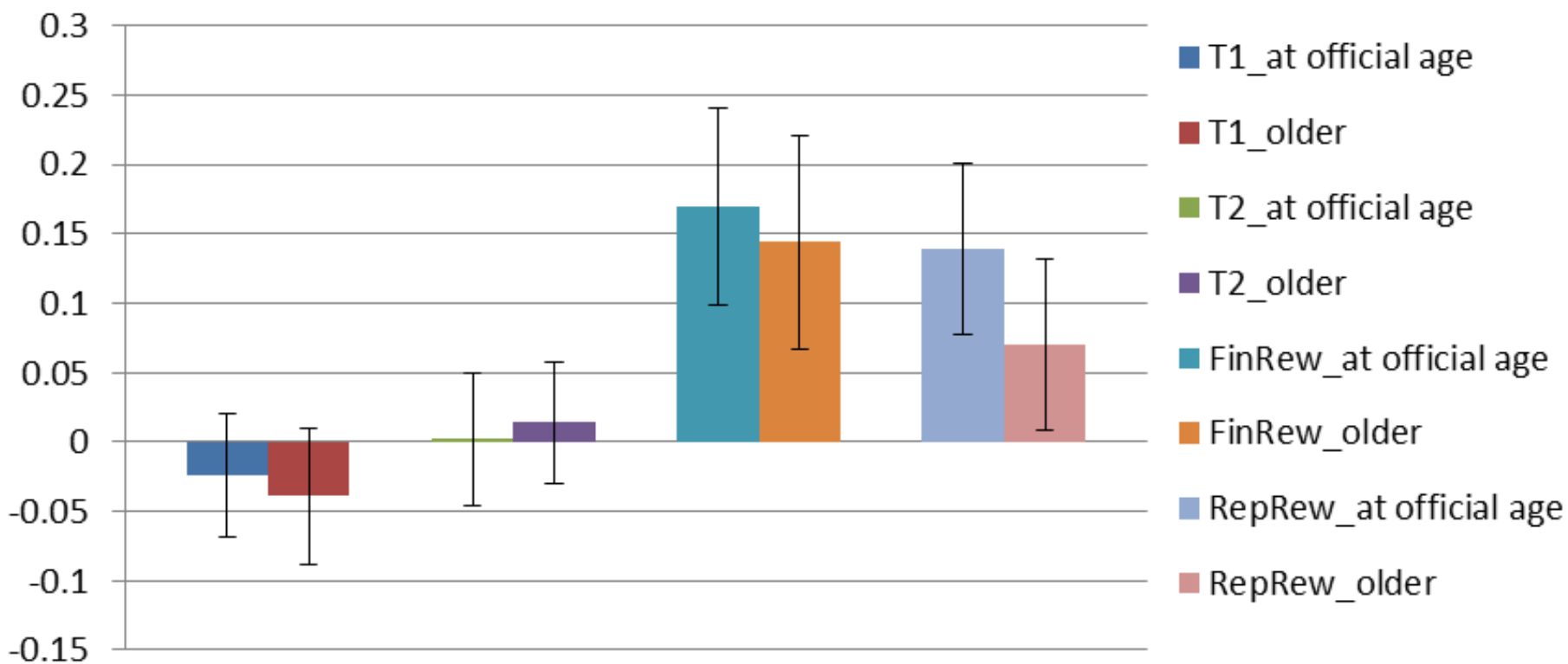
By official age

Mathematics, by official age



By official age

English, by official age



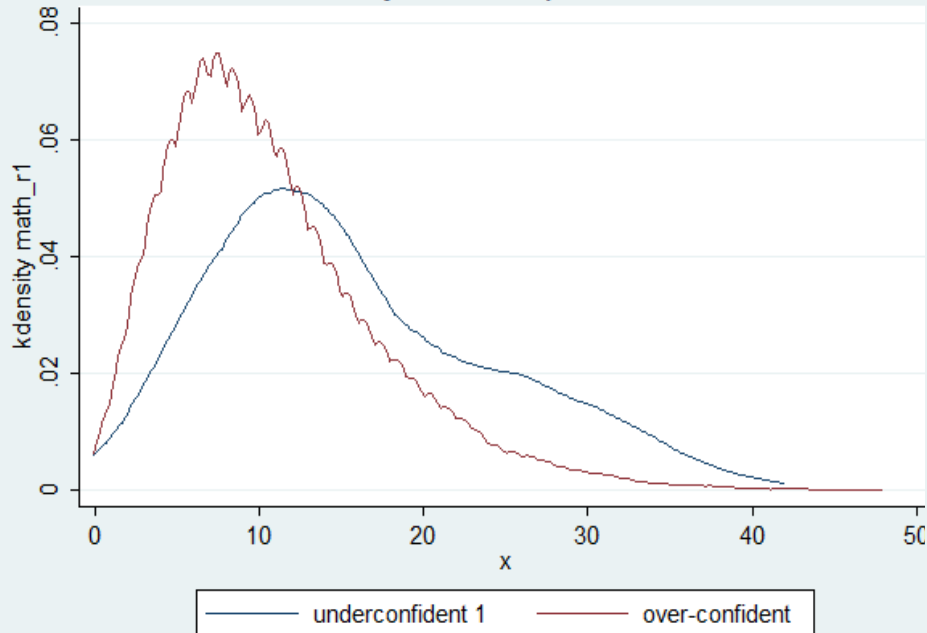
Issues

- Imbalances between treatment and control groups with respect to baseline characteristics
 - imputation methods
- Rewards not introduced in two schools that were randomized to receive reputation rewards and one school went bankrupt
 - 2-stage least squares
- Non-random attrition
 - Inverse probability weighting

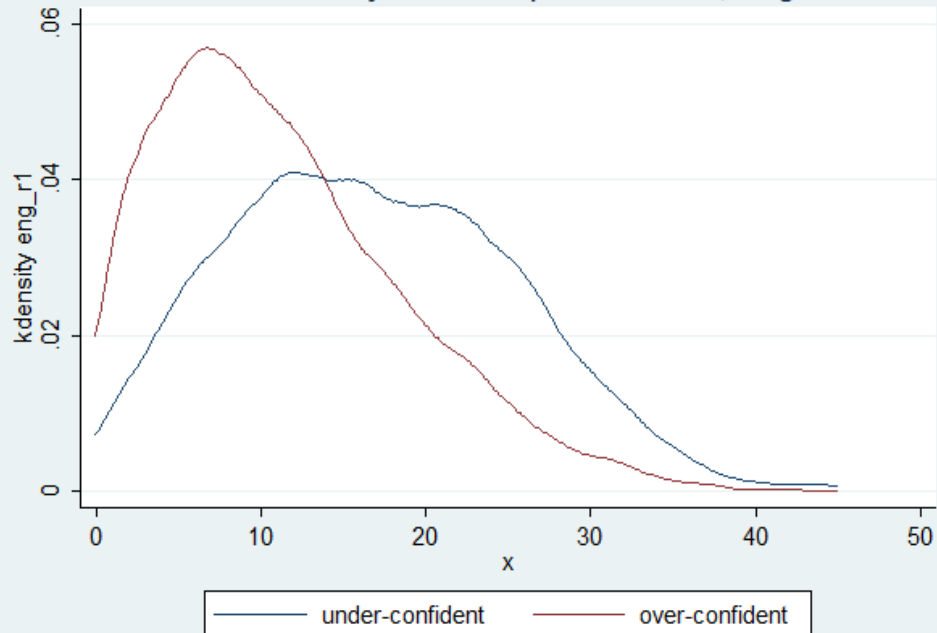
Who often mis-calibrates?

- No significant gender or age differences in mis-calibration patterns
- Overconfidence: if expectations are above real score

Confidence by baseline performance, Math

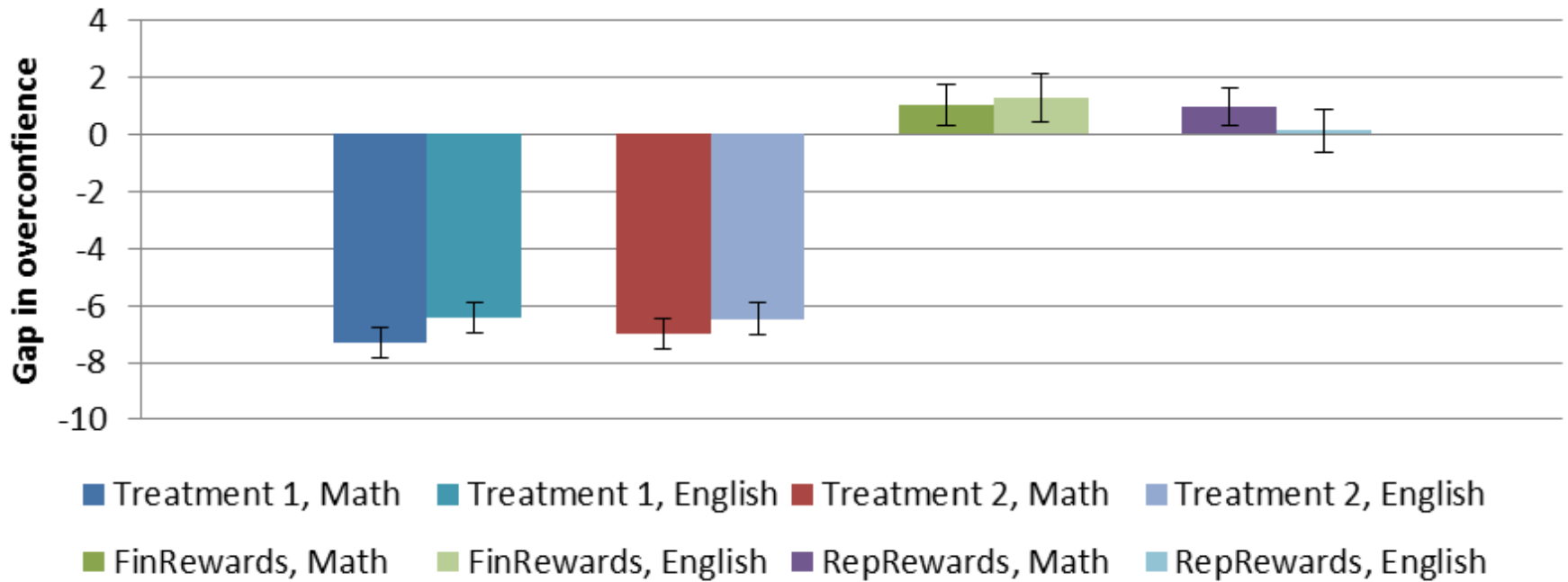


Confidence by baseline performance, English



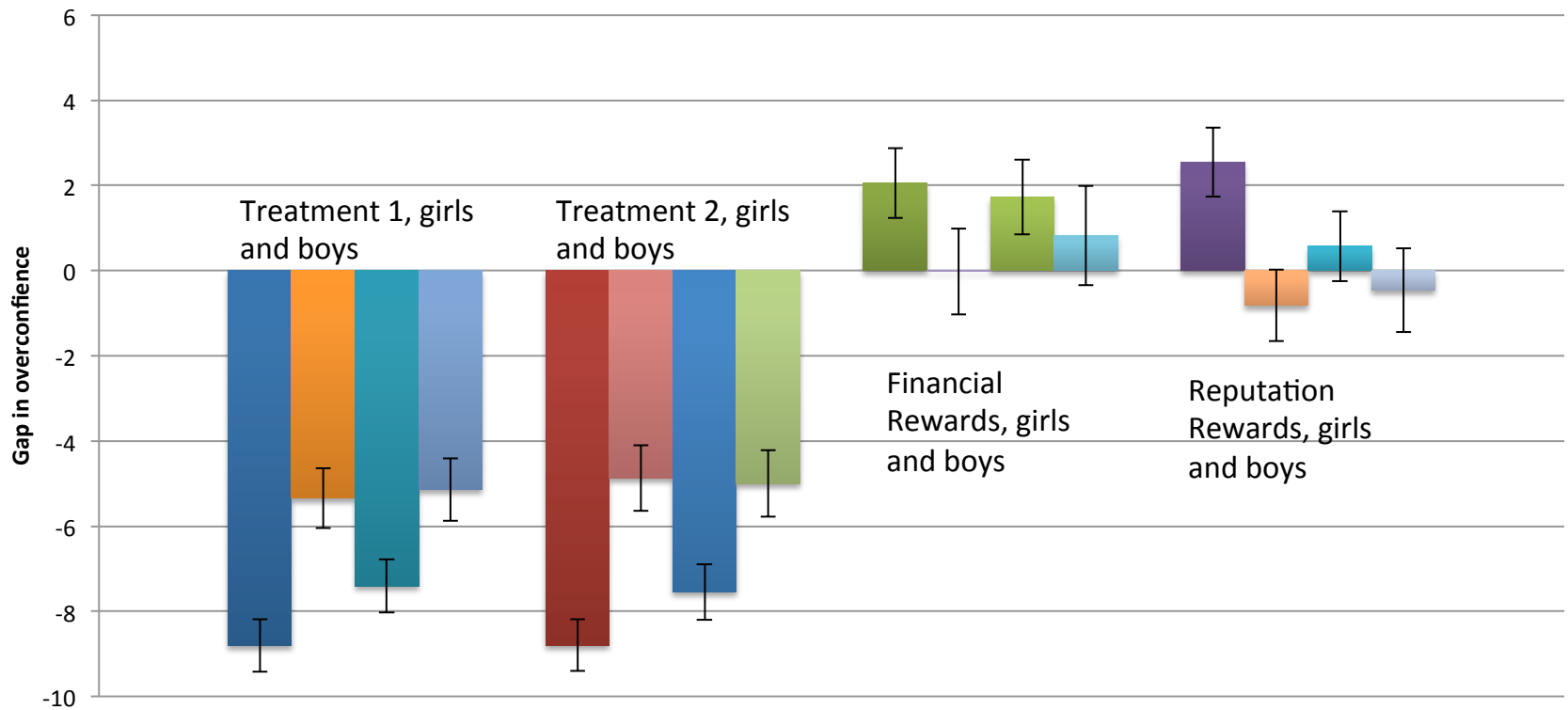
Calibration of the overconfidence

Treatment effects on overconfidence, Math and English



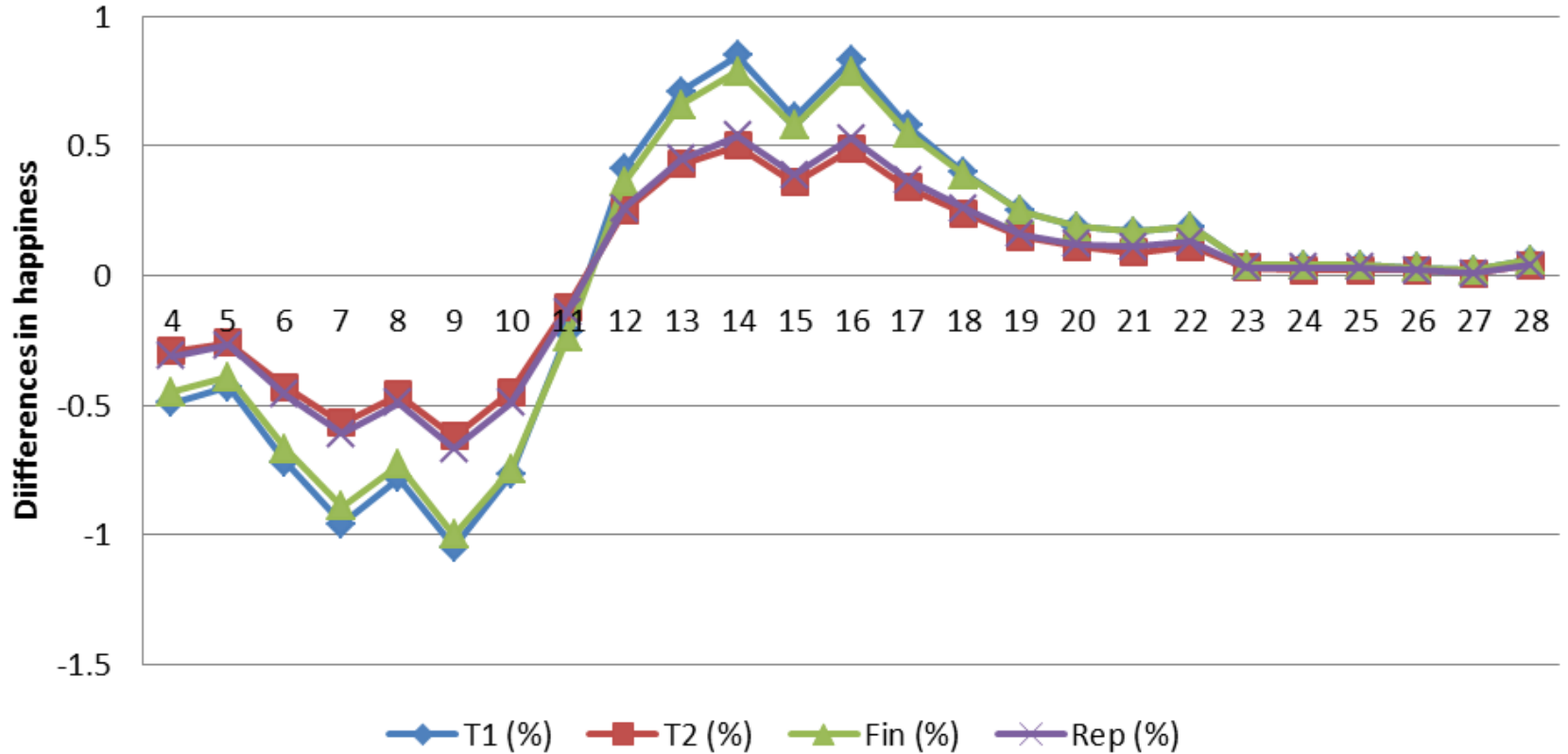
Overconfidence, by gender and subject

Treatment effects on overconfidence, by gender in Math and English



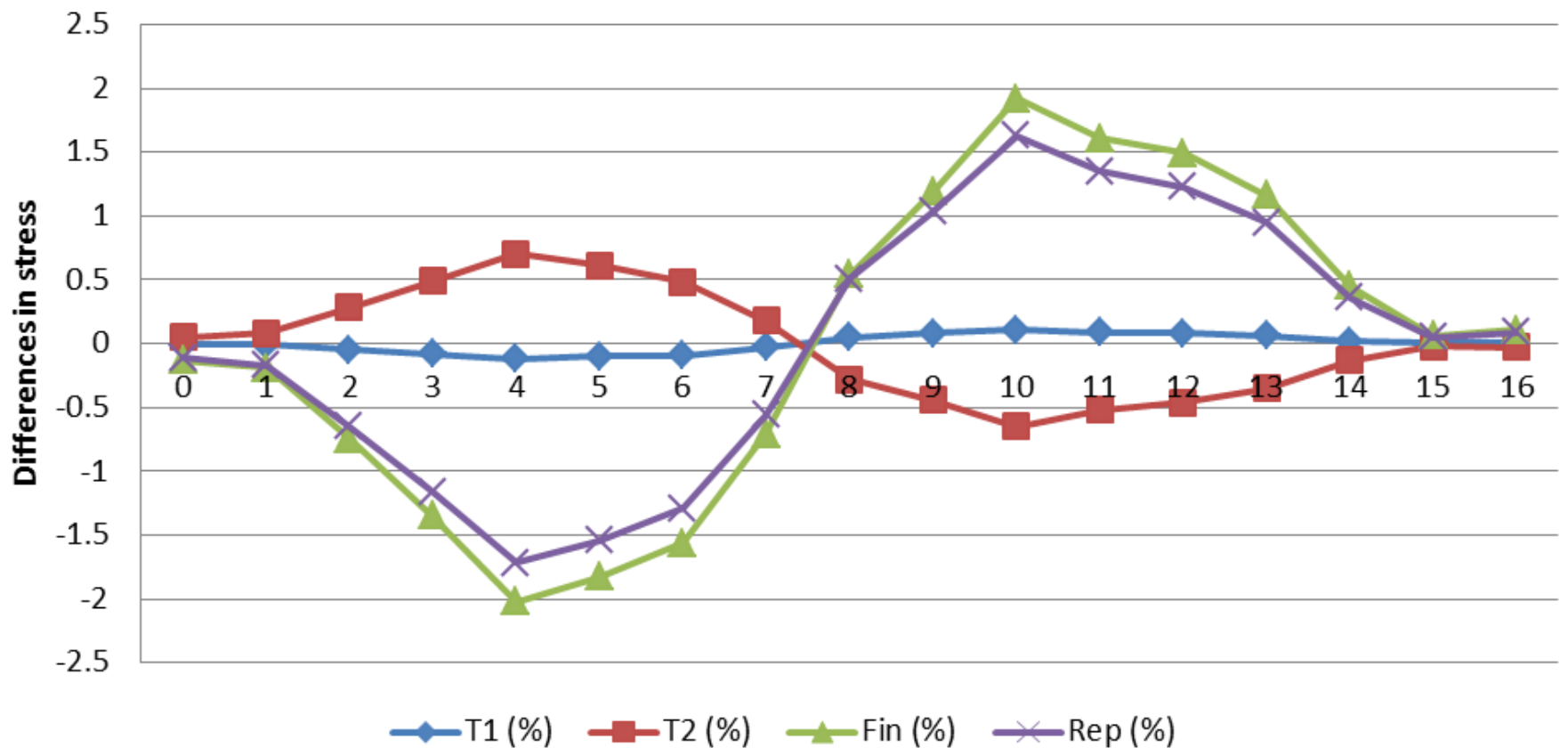
Happiness

Marginal effects of interventions on happiness level, by category



Stress

Marginal effects of interventions on stress level, by category



Predictions versus my results

- Girls seem to improve mainly when given feedback (by 0.15 standard deviation)
 - Girls care about their reputation/status within their class but shade away from competition
 - Rewards introduced additionally increase the magnitude of the effect size but not significantly
- Boys seem to improve only when rewarded (0.17 to 0.2 standard deviations)
 - No additional value of feedback
- Short lasting effect of feedback, prevailing effect of the rewards
 - Need to be confirmed with data on effort

Results

- Result 1: all treatment lead to small to moderate improvements in performance of students (0.1-0.15 standard deviations)
- Result 2: driving mechanism behind the overall treatment effects differ by gender and have different time component
- Result 3: Comparison of IPW and imputation methods reveal similar estimates to OLS
- Result 4: Financial rewards depend on level of study, feedback seems not to depend

Further work

- The impacts of incentives on other than learning outcomes
 - Effort, happiness, stress, overconfidence and aspirations
- Dynamics within feedback groups
- Krueger (1999) the average treatment effect on percentile ranks

Results by initial performance

Dependent variable: Math score	GIRLS				BOYS			
	Quart 1	Quart 2	Quart 3	Quart 4	Quart 1	Quart 2	Quart 3	Quart 4
Within class social comparison (T1)	0.126** (0.060)	0.087 (0.070)	0.135 (0.111)	0.486*** (0.106)	-0.159** (0.074)	-0.020 (0.096)	-0.006 (0.097)	0.152 (0.131)
Across class social comparison(T2)	0.049 (0.054)	0.126[§] (0.075)	0.242** (0.123)	0.476*** (0.142)	-0.133* (0.077)	-0.067 (0.112)	0.026 (0.114)	0.233** (0.094)
Financial Rewards	-0.057 (0.080)	0.037 (0.090)	0.185[§] (0.123)	0.076 (0.178)	0.089 (0.095)	0.309** (0.123)	0.255[§] (0.157)	0.159 (0.126)
Reputational Rewards	0.002 (0.082)	0.094 (0.091)	-0.031 (0.123)	0.052 (0.135)	0.156* (0.080)	0.237** (0.118)	0.123 (0.135)	0.015 (0.109)

Dependent variable: English score	GIRLS				BOYS			
	Quart 1	Quart 2	Quart 3	Quart 4	Quart 1	Quart 2	Quart 3	Quart 4
Within class social comparison (T1)	-0.028 (0.063)	-0.038 (0.066)	0.025 (0.066)	-0.059 (0.086)	0.027 (0.097)	-0.005 (0.086)	-0.099 (0.079)	0.002 (0.083)
Across class social comparison(T2)	-0.001 (0.078)	-0.011 (0.062)	0.032 (0.069)	0.072 (0.091)	-0.005 (0.085)	-0.014 (0.087)	-0.034 (0.095)	0.076 (0.076)
Financial Rewards	-0.064 (0.103)	0.007 (0.101)	0.195** (0.091)	0.301*** (0.094)	0.151 (0.122)	0.171* (0.098)	0.357*** (0.099)	0.426*** (0.096)
Reputational Rewards	-0.006 (0.106)	0.024 (0.080)	0.211** (0.096)	0.101 (0.082)	-0.008 (0.127)	0.146* (0.084)	0.180** (0.089)	0.121 (0.097)