Supplemental Appendix

Apart but Connected: Online Tutoring, Cognitive Outcomes, and Soft Skill

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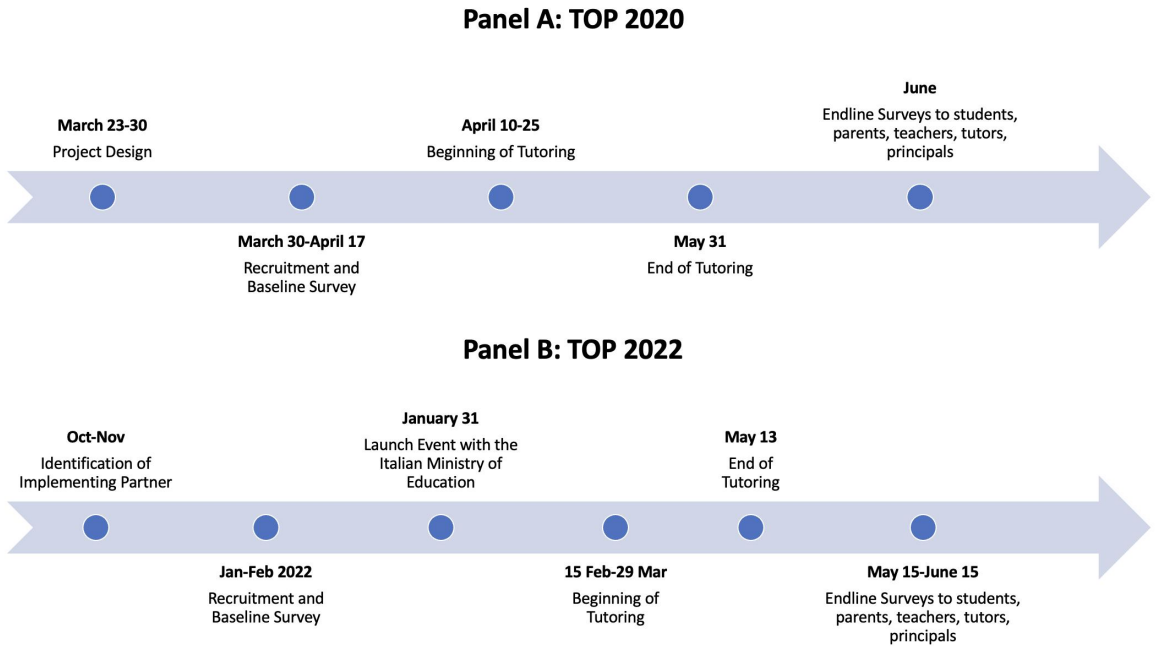
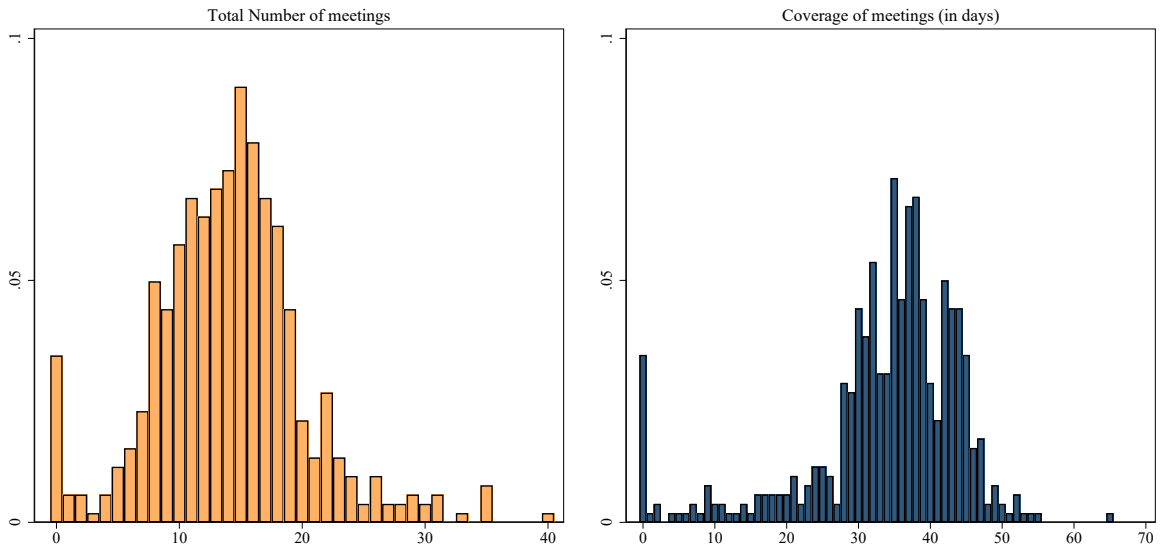
A Additional Tables and Figures

Figure A.1. Timeline of TOP



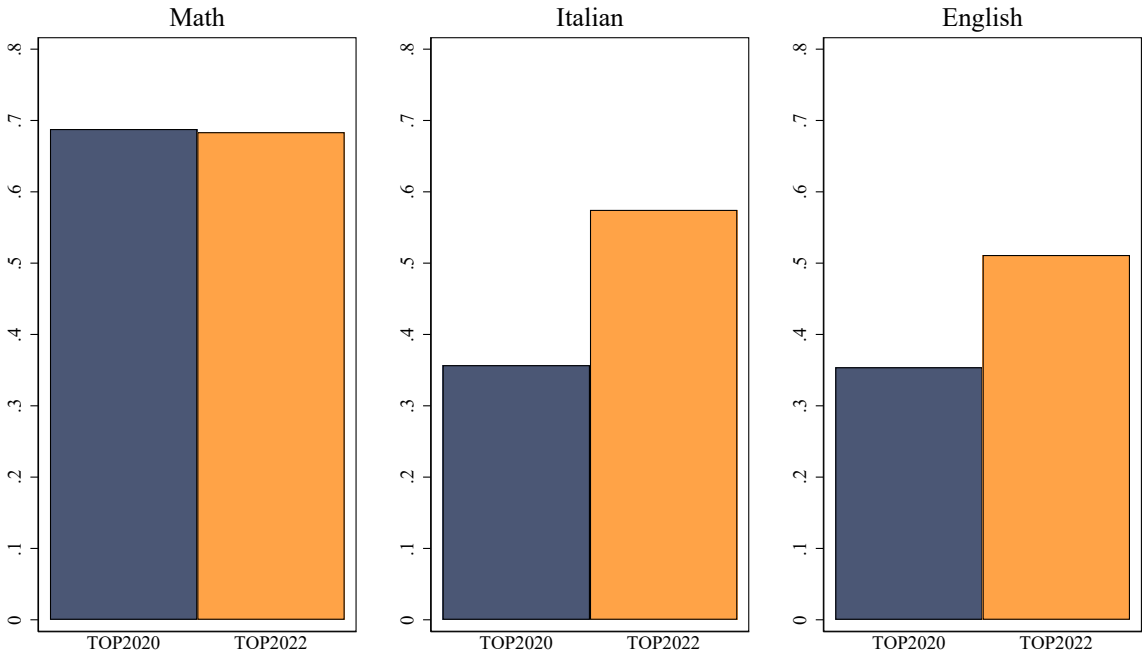
Notes: This Figure shows the timeline for the implementation of TOP 2020 in Panel A and TOP 2022 in Panel B.

Figure A.2. Number of tutoring meetings and coverage in days



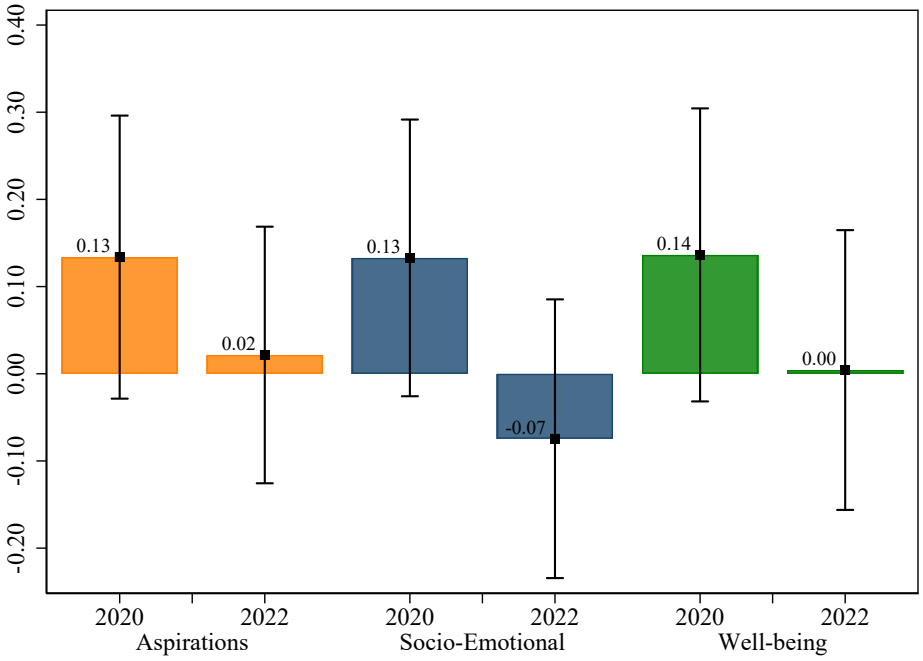
Notes: This Figure shows the total number of tutoring meetings (left panel) and the number of days from the beginning to the end of the tutoring (right panel) for TOP 2020. The data used in these graphs are reported by tutors in the registry. The Figure shows data from 522 treated students: 8 students did the tutoring but we do not have precise information from the tutors on the number of meetings.

Figure A.3. Main Subjects During Tutoring



Notes: This Figure shows the main subjects done during the tutoring meetings for TOP 2020 (blue bar) and for TOP 2022 (orange bar), as reported by tutors at endline.

Figure A.4. The impact of three hours of individual tutoring on non-academic outcomes



Notes: This Figure reports OLS estimates of the impact of 3 hours per week of individual tutoring on "aspirations", "socio-emotional skills", and "psychological well-being". Each index is standardized to have mean 0 and the standard deviation is 1 in the control group. For each outcome, the first bar shows the impact on TOP 2020 and the second bar on TOP 2022, with 95% confidence intervals. Controls included are parental education and occupation, gender, immigration status, learning disorders, school grade, teacher-assigned grades, SES status, and test scores in math at baseline.

Table A.1. Characteristics of provinces with schools participating/not participating in TOP 2020

Variable	(1) No TOP	(2) TOP	(3) Diff.	(4) Std. Diff.
Macro-area: North	0.313	0.650	0.337	0.501
	(0.467)	(0.483)	(0.095)	
Macro-area: Center	0.209	0.200	-0.009	-0.016
	(0.410)	(0.405)	(0.082)	
Macro-area: South	0.478	0.150	-0.328	-0.529
	(0.503)	(0.362)	(0.091)	
Level of education: Elementary	0.305	0.287	-0.017	-0.453
	(0.026)	(0.027)	(0.005)	
Level of education: Middle school	0.300	0.297	-0.003	-0.079
	(0.024)	(0.023)	(0.005)	
Level of education: Diploma	0.297	0.309	0.012	0.354
	(0.028)	(0.020)	(0.005)	
Level of education: University	0.101	0.109	0.008	0.296
	(0.015)	(0.023)	(0.004)	
Covid-19 cases March'20 (1000 inhabitants)	1.477	2.234	0.757	0.266
	(1.799)	(2.199)	(0.391)	
Covid-19 cases April'20 (1000 inhabitants)	2.889	4.399	1.511	0.333
	(3.024)	(3.376)	(0.631)	
Covid-19 cases May'20 (1000 inhabitants)	3.209	4.961	1.752	0.343
	(3.418)	(3.800)	(0.712)	
Immigrants 2020	0.070	0.096	0.026	0.592
	(0.033)	(0.030)	(0.006)	
Unemployment rate (2019)	11.678	8.316	-3.362	-0.438
	(5.908)	(4.912)	(1.111)	
Joint test				0.000
Observations	67	40	107	

Notes: This table shows the characteristics of provinces that had at least one treated school (column 2) compared to provinces with no treated schools (column 1) for TOP 2020. Column (3) shows the difference in means between the two groups and column (4) provides the standardized difference between group averages. In parenthesis, the first two columns show the standard deviations of the mean, while the third column shows the standard errors of the difference between treatment and control groups. The second to last row shows the P-value of an F-test for the joint significance of all the coefficients in a regression of the a binary indicator equal to one if the province in participating in TOP 2020 on all the covariates in the table.

Table A.2. Balance Table TOP students vs. schoolmates

Variable	(1) TOP	(2) No TOP	(3) Diff.	(4) Std. Diff.
Immigrant	0.170	0.132	-0.038	-0.075
	(0.376)	(0.339)	(0.011)	
Student is male	0.602	0.514	-0.088	-0.126
	(0.490)	(0.500)	(0.017)	
Father was born in Italy	0.814	0.841	0.027	0.050
	(0.389)	(0.366)	(0.013)	
Mother was born in Italy	0.754	0.809	0.055	0.094
	(0.431)	(0.393)	(0.014)	
Mother edu: High-school	0.333	0.393	0.060	0.089
	(0.472)	(0.489)	(0.018)	
Mother edu: Degree	0.101	0.200	0.099	0.197
	(0.302)	(0.400)	(0.015)	
Father edu: high-school	0.279	0.351	0.072	0.110
	(0.449)	(0.477)	(0.018)	
Father edu: Degree	0.079	0.146	0.068	0.152
	(0.269)	(0.353)	(0.013)	
Low SES	0.602	0.445	-0.157	-0.225
	(0.490)	(0.497)	(0.018)	
Std Invalsi score maths, 5th grade	-0.562	0.025	0.587	0.434
	(0.915)	(0.996)	(0.036)	
Std Invalsi score Italian, 5th grade	-0.559	0.024	0.583	0.435
	(0.897)	(0.997)	(0.036)	
Baseline Grade Math	6.154	7.214	1.060	0.595
	(1.132)	(1.375)	(0.056)	
Baseline Grade Italian	6.475	7.273	0.799	0.550
	(0.920)	(1.123)	(0.046)	
Baseline Grade in English	6.466	7.374	0.908	0.545
	(1.054)	(1.292)	(0.053)	
Joint test				0.000
Observations	929	20,931	21,860	

Notes: This table reports characteristics of TOP 2020 students (column 1) and their schoolmates (column 2). Column (3) reports the difference in means between column (2) and columns (1). Column (4) reports the standardized difference between group averages. All variables are measured at baseline in administrative data. The second to last row shows the P-value of an F-test for the joint significance of all the coefficients in a regression of the a binary indicator equal to one if the student participated in TOP 2020 on all the covariates in the table.

Table A.3. Balance Table TOP 2020 (baseline sample)

	(1) Control	(2) Treatment	(3) 3h Tutoring	(4) 6h Tutoring	(5) P-value (1)-(2)	(6) P-value (1)-(3)	(7) P-value (3)-(4)
Students							
Survey Data							
Female	0.381	0.412	0.403	0.437	0.298	0.481	0.547
Immigrant	0.169	0.178	0.161	0.225	0.690	0.962	0.403
Learning Disorder	0.337	0.312	0.297	0.355	0.410	0.307	0.486
School grade 6	0.325	0.313	0.313	0.315	0.692	0.823	0.767
School grade 7	0.338	0.342	0.351	0.315	0.934	0.773	0.571
School grade 8	0.336	0.345	0.336	0.371	0.760	0.945	0.401
Admin data							
Baseline math grade	6.270	6.152	6.190	6.049	0.066	0.121	0.692
Baseline Italian grade	6.330	6.397	6.424	6.324	0.250	0.357	0.880
Baseline English grade	6.456	6.436	6.510	6.234	0.759	0.788	0.099
Parents							
SES Status	-0.273	-0.230	-0.202	-0.306	0.400	0.274	0.401
Single parent household	0.258	0.219	0.221	0.211	0.144	0.326	0.407
Mother Education: High-school	0.469	0.439	0.412	0.514	0.344	0.071	0.026
Mother Education: University	0.126	0.113	0.123	0.087	0.526	0.699	0.495
Father Education: High-school	0.358	0.380	0.384	0.370	0.452	0.472	0.892
Father Education: University	0.084	0.063	0.065	0.058	0.201	0.245	0.945
Mother not employed	0.312	0.317	0.320	0.308	0.880	0.695	0.554
Mother Occupation: white-collar	0.270	0.268	0.274	0.252	0.937	0.983	0.789
Mother Occupation: blue-collar	0.391	0.379	0.372	0.399	0.698	0.543	0.542
Father not employed	0.132	0.185	0.186	0.182	0.019	0.026	0.805
Father Occupation: white-collar	0.282	0.270	0.274	0.259	0.679	0.675	0.958
Father Occupation: blue-collar	0.558	0.511	0.506	0.524	0.124	0.148	0.894
Parental time helping homework	49.062	48.553	49.003	47.319	0.846	0.947	0.777
Joint test					0.117	0.244	0.659
Observations	529	530	387	143			

Notes: This table reports characteristics of control students (column 1) and treated students (column 2) in TOP 2020. Columns (3) and (4) divide the treated students in those assigned to 3 hours vs. 6 hours of tutoring. P-values for difference in means, controlling for the round fixed effects as in our main specification, are reported in column (5). The p-values for the coefficient "Treatment" and "Treatment Intense" are reported in columns (6) and (7), respectively. As in our main specification, we control for whether the student was identified for intense tutoring for the last two columns. All variables are measured at baseline. The second to last row shows in Column 5 the P-value of an F-test for the joint significance of all the coefficients in a regression of the treatment and randomization round FE. Next are shown the P-values of a Chi^2-test for the joint significance of all the coefficients in a multinomial logit regression on the 3 hours treatment against the control (Column 6) and the six hours treatment against the 3 hours treatment (Column 7).

Table A.4. Balance Table TOP 2022 (baseline sample)

	(1) Control	(2) Treatment	(3) Individual Tutoring	(4) Group Tutoring	(5) P-value (1)-(2)	(6) P-value (1)-(3)	(7) P-value (3)-(4)
Students							
Survey Data							
Female	0.447	0.456	0.401	0.528	0.615	0.355	0.012
Immigrant	0.253	0.293	0.310	0.272	0.077	0.018	0.098
Learning Disorder	0.247	0.262	0.275	0.245	0.546	0.426	0.585
School grade 6	0.268	0.331	0.310	0.358	0.019	0.220	0.161
School grade 7	0.368	0.367	0.363	0.374	0.941	0.785	0.694
School grade 8	0.364	0.301	0.327	0.268	0.026	0.363	0.066
Admin data							
Baseline math grade	6.347	6.393	6.442	6.330	0.444	0.467	0.881
Baseline Italian grade	6.596	6.628	6.630	6.625	0.569	0.596	0.943
Baseline English grade	6.637	6.755	6.761	6.746	0.189	0.113	0.395
Parents							
SES Status	-0.375	-0.442	-0.445	-0.439	0.291	0.173	0.332
Single parent household	0.246	0.244	0.228	0.264	0.898	0.553	0.377
Mother Education: High-school	0.441	0.403	0.423	0.378	0.304	0.818	0.227
Mother Education: University	0.124	0.124	0.128	0.120	0.826	0.713	0.720
Father Education: High-school	0.375	0.392	0.435	0.337	0.504	0.119	0.056
Father Education: University	0.069	0.082	0.083	0.081	0.364	0.505	0.859
Mother not employed	0.309	0.336	0.354	0.313	0.287	0.122	0.219
Mother Occupation: white-collar	0.281	0.259	0.278	0.234	0.217	0.476	0.525
Mother Occupation: blue-collar	0.381	0.367	0.327	0.419	0.796	0.204	0.055
Father not employed	0.145	0.173	0.152	0.200	0.117	0.411	0.338
Father Occupation: white-collar	0.270	0.272	0.287	0.253	0.913	0.895	0.670
Father Occupation: blue-collar	0.542	0.506	0.497	0.517	0.132	0.300	0.658
Parental time helping homework	32.272	35.572	36.121	34.868	0.146	0.227	0.982
Joint test					0.336	0.318	0.074
Observations	530	607	342	265			

Notes: This table reports characteristics of control students (column 1) and treated students (column 2) in TOP 2022. Columns (3) and (4) divide the treated students in those assigned to individual vs. group tutoring. P-values for difference in means, controlling for the round fixed effects as in our main specification, are reported in column (5). The p-values for the coefficient "Individual Tutoring" and "Group Tutoring" are reported in columns (6) and (7), respectively. All variables are measured at baseline. The second to last row shows in Column 5 the P-value of an F-test for the joint significance of all the coefficients in a regression of the treatment and randomization round FE. Next are shown the P-values of a Chi^2-test for the joint significance of all the coefficients in a multinomial logit regression on the individual group treatment against the control (Column 6) and the group treatment against the individual treatment (Column 7).

Table A.5. Characteristics of students: TOP 2020 vs. TOP 2022

	(1) All	(2) TOP2020	(3) TOP2022	(4) P-value	(5) Std diff.
Students					
Survey Data					
Female	0.425	0.396	0.452	0.008	0.113
Immigrant	0.226	0.173	0.274	0.000	0.242
Learning Disorder	0.288	0.324	0.255	0.000	-0.152
School grade 6	0.310	0.319	0.302	0.376	-0.037
School grade 7	0.354	0.340	0.368	0.175	0.059
School grade 8	0.336	0.341	0.331	0.614	-0.021
Admin data					
Baseline math grade	6.294	6.211	6.371	0.001	0.147
Baseline Italian grade	6.493	6.363	6.613	0.000	0.259
Baseline English grade	6.578	6.446	6.700	0.000	0.225
Parents					
SES Status	-0.337	-0.287	-0.411	0.006	-0.141
Single parent household	0.242	0.238	0.245	0.708	0.016
Mother Education: High-school	0.437	0.454	0.421	0.121	-0.067
Mother Education: University	0.122	0.120	0.124	0.759	0.012
Father Education: High-school	0.377	0.369	0.384	0.475	0.031
Father Education: University	0.075	0.074	0.076	0.804	0.008
Mother not employed	0.319	0.314	0.324	0.644	0.021
Mother Occupation: white-collar	0.269	0.269	0.269	1.000	0.000
Mother Occupation: blue-collar	0.379	0.385	0.374	0.580	-0.023
Father not employed	0.159	0.159	0.160	0.927	0.003
Father Occupation: white-collar	0.273	0.276	0.271	0.799	-0.011
Father Occupation: blue-collar	0.528	0.534	0.522	0.572	-0.024
Parental time helping homework	41.113	48.810	34.028	0.000	-0.381
P-value of F test				0.000	
Observations	2,196	1,059	1,137		

Notes: This table reports characteristics of all students (column 1), students in TOP 2020 (column 2), and students in TOP 2022 (column 3). Column 4 reports p-values for difference in means. Column 5 reports the standardized difference between group averages. All variables are measured at baseline. The SES Status is the variable of "Economic, Social and Cultural Status" created by INVALSI including three components: parental occupation, parental education, and the ownership of specific goods (quite space to study, computer, desk, internet at home, own bedroom, encyclopedia). Parents are not employed when they are homemakers, unemployed or retired. The second to last row shows the P-value of an F-test for the joint significance of all the coefficients in a regression of a binary indicator equal to one if the student participated in TOP 2022 on all the covariates in the table.

Table A.6. Attrition between baseline and endline sample

	(1)	(2)	(3)	(4)	(5)	(6)
Sample	All	All	TOP2020		TOP2022	
	Full	Full	Treatment	Control	Treatment	Control
Dependent variable: Dummy for endline completion						
Treatment	0.305	0.300				
	(0.017)	(0.017)				
Female		0.011	0.017	-0.015	0.007	-0.009
		(0.017)	(0.028)	(0.046)	(0.023)	(0.038)
Immigrant		0.047	-0.026	0.097	0.023	0.123
		(0.021)	(0.042)	(0.062)	(0.027)	(0.045)
Learning Disorder		-0.024	-0.041	-0.038	-0.005	-0.043
		(0.019)	(0.029)	(0.048)	(0.027)	(0.046)
School grade 6						
School grade 7						
Baseline math grade		0.005	0.014	-0.015	0.026	0.005
		(0.008)	(0.015)	(0.023)	(0.011)	(0.020)
Single parent household		-0.028	-0.023	0.000	-0.061	-0.003
		(0.022)	(0.037)	(0.053)	(0.030)	(0.049)
Mother Education: High-school		0.015	0.022	0.033	0.031	-0.038
		(0.020)	(0.032)	(0.055)	(0.029)	(0.046)
Mother Education: University		0.005	-0.025	-0.030	0.052	-0.028
		(0.035)	(0.061)	(0.095)	(0.039)	(0.075)
Father Education: High-school		0.017	0.024	0.030	0.033	-0.010
		(0.020)	(0.032)	(0.053)	(0.025)	(0.045)
Father Education: University		0.036	0.103	0.139	-0.022	-0.005
		(0.040)	(0.068)	(0.114)	(0.050)	(0.083)
Mother Occupation: White-collar		-0.035	0.015	0.357	-0.022	-0.196
		(0.051)	(0.229)	(0.263)	(0.049)	(0.122)
Mother Occupation: Blue-collar		-0.082	-0.060	0.226	-0.009	-0.206
		(0.050)	(0.227)	(0.266)	(0.051)	(0.122)
Father Occupation: White-collar		0.002	-0.162	-0.387	0.056	0.037
		(0.052)	(0.157)	(0.198)	(0.065)	(0.104)
Father Occupation: Blue-collar		0.064	-0.120	-0.278	0.101	0.067
		(0.051)	(0.155)	(0.196)	(0.064)	(0.100)
High treatment intensity			-0.024			
			(0.032)			
Higher than average num. meetings			0.089			
			(0.028)			
Group tutoring					-0.027	
					(0.030)	
Mean Dep	.753	.753	.879	.463	.923	.723
Obs.	2196	2196	513	529	607	530
R^2	0.164	0.188	0.084	0.090	0.085	0.122

Notes: OLS estimates, robust standard errors in parentheses. The dependent variable is a dummy which assumes value 1 if the student completed the endline survey. Columns (1) and (2) include all students who completed the baseline surveys in TOP 2020 or 2022. Columns (3) and (4) restrict the sample to students in TOP 2020 assigned to the treatment and control group, respectively. Columns (5) and (6) restrict the sample to students in TOP 2022 assigned to the treatment and control group, respectively.

Table A.7. Balance Table TOP 2020 (endline test score sample)

	(1) Control	(2) Treatment	(3) 3h Tutoring	(4) 6h Tutoring	(5) P-value (1)-(2)	(6) P-value (1)-(3)	(7) P-value (3)-(4)
Students							
Survey Data							
Female	0.373	0.419	0.418	0.424	0.213	0.230	0.924
Immigrant	0.197	0.175	0.162	0.208	0.469	0.434	0.737
Learning Disorder	0.317	0.312	0.303	0.339	0.912	0.853	0.769
School grade 6	0.367	0.315	0.318	0.310	0.196	0.308	0.609
School grade 7	0.335	0.337	0.335	0.341	0.986	0.953	0.834
School grade 8	0.298	0.348	0.347	0.349	0.193	0.272	0.765
Admin data							
Baseline math grade	6.281	6.158	6.198	6.048	0.103	0.179	0.524
Baseline Italian grade	6.421	6.403	6.421	6.352	0.710	0.602	0.648
Baseline English grade	6.533	6.434	6.510	6.226	0.204	0.447	0.125
Parents							
SES Status	-0.267	-0.278	-0.253	-0.343	0.853	0.967	0.703
Single parent household	0.250	0.214	0.220	0.200	0.330	0.604	0.269
Mother Education: High-school	0.500	0.444	0.410	0.537	0.142	0.023	0.012
Mother Education: University	0.142	0.111	0.122	0.083	0.190	0.280	0.507
Father Education: High-school	0.368	0.381	0.378	0.388	0.853	0.942	0.787
Father Education: University	0.105	0.065	0.065	0.066	0.080	0.065	0.629
Mother not employed	0.310	0.318	0.326	0.294	0.856	0.569	0.269
Mother Occupation: white-collar	0.310	0.273	0.271	0.278	0.262	0.193	0.519
Mother Occupation: blue-collar	0.363	0.373	0.368	0.389	0.683	0.808	0.689
Father not employed	0.118	0.180	0.179	0.183	0.027	0.038	0.953
Father Occupation: white-collar	0.273	0.264	0.265	0.262	0.760	0.660	0.697
Father Occupation: blue-collar	0.584	0.519	0.521	0.516	0.120	0.184	0.739
Parental time helping homework	47.591	49.660	50.775	46.689	0.621	0.438	0.351
Joint test					0.090	0.203	0.756
Observations	245	466	340	126			

Notes: This table reports characteristics of control students (column 1) and treated students (column 2) in TOP 2020, restricting the same to those students who completed the endline test score. Columns (3) and (4) divide the treated students in those assigned to 3 hours vs. 6 hours of tutoring. P-values for difference in means, controlling for the round fixed effects as in our main specification, are reported in column (5). The p-values for the coefficient "Treatment" and "Treatment Intense" are reported in columns (6) and (7), respectively. As in our main specification, we control for whether the student was identified for intense tutoring. All variables are measured at baseline. The second to last row shows in Column 5 the P-value of an F-test for the joint significance of all the coefficients in a regression of the treatment and randomization round FE. Next are shown the P-values of a Chi^2-test for the joint significance of all the coefficients in a multinomial logit regression on the 3 hours treatment against the control (Column 6) and the six hours treatment against the 3 hours treatment (Column 7).

Table A.8. Balance Table TOP 2022 (endline test score sample)

	(1) Control	(2) Treatment	(3) Individual Tutoring	(4) Group Tutoring	(5) P-value (1)-(2)	(6) P-value (1)-(3)	(7) P-value (3)-(4)
Students							
Survey Data							
Female	0.454	0.457	0.401	0.534	0.867	0.222	0.008
Immigrant	0.287	0.296	0.307	0.282	0.633	0.261	0.158
Learning Disorder	0.236	0.257	0.270	0.239	0.429	0.321	0.536
School grade 6	0.311	0.329	0.311	0.353	0.528	0.910	0.400
School grade 7	0.399	0.368	0.366	0.370	0.335	0.307	0.697
School grade 8	0.290	0.304	0.323	0.277	0.709	0.335	0.204
Admin data							
Baseline math grade	6.396	6.429	6.472	6.371	0.610	0.548	0.757
Baseline Italian grade	6.637	6.646	6.633	6.662	0.878	0.955	0.881
Baseline English grade	6.683	6.768	6.781	6.751	0.399	0.172	0.219
Parents							
SES Status	-0.400	-0.437	-0.442	-0.430	0.638	0.427	0.415
Single parent household	0.235	0.230	0.224	0.239	0.885	0.684	0.581
Mother Education: High-school	0.422	0.414	0.434	0.388	0.985	0.530	0.205
Mother Education: University	0.127	0.126	0.127	0.125	0.777	0.530	0.426
Father Education: High-school	0.366	0.408	0.446	0.355	0.188	0.080	0.208
Father Education: University	0.072	0.080	0.079	0.082	0.543	0.787	0.604
Mother not employed	0.326	0.330	0.348	0.307	0.802	0.351	0.155
Mother Occupation: white-collar	0.266	0.259	0.280	0.231	0.610	0.894	0.542
Mother Occupation: blue-collar	0.373	0.371	0.332	0.424	0.994	0.297	0.044
Father not employed	0.146	0.166	0.146	0.193	0.270	0.574	0.439
Father Occupation: white-collar	0.253	0.270	0.280	0.256	0.541	0.876	0.467
Father Occupation: blue-collar	0.559	0.518	0.509	0.529	0.143	0.297	0.675
Parental time helping homework	32.715	35.678	36.378	34.737	0.256	0.300	0.880
Joint test					0.964	0.713	0.089
Observations	383	560	322	238			

Notes: This table reports characteristics of control students (column 1) and treated students (column 2) in TOP 2022, restricting the same to those students who completed the endline test score. Columns (3) and (4) divide the treated students in those assigned to individual vs. group tutoring. P-values for difference in means, controlling for the round fixed effects as in our main specification, are reported in column (5). The p-values for the coefficient "Individual Tutoring" and "Group Tutoring" are reported in columns (6) and (7), respectively. All variables are measured at baseline. The second to last row shows in Column 5 the P-value of an F-test for the joint significance of all the coefficients in a regression of the treatment and randomization round FE. Next are shown the P-values of a Chi^2-test for the joint significance of all the coefficients in a multinomial logit regression on the individual group treatment against the control (Column 6) and the group treatment against the individual treatment (Column 7).

Table A.9. Characteristics of tutors: TOP 2020 vs. TOP 2022

	(1) All	(2) TOP2020	(3) TOP2022	(4) P-value	(5) Std diff.
Female	0.718	0.701	0.736	0.221	0.078
Immigrant	0.055	0.017	0.097	0.000	0.351
GPA	26.563	26.726	26.380	0.039	-0.135
Volunteering experience	0.773	0.822	0.719	0.000	-0.246
Tutoring experience	0.871	0.958	0.778	0.000	-0.537
Tutor's motivation: wants to help / be useful	0.699	0.831	0.555	0.000	-0.601
Major: Economics	0.288	0.285	0.291	0.845	0.013
Major: Education	0.044	0.065	0.021	0.000	-0.215
Major: STEM	0.303	0.337	0.266	0.014	-0.154
Undergraduate Degree	0.525	0.473	0.582	0.001	0.218
Younger siblings	0.672	0.697	0.644	0.293	-0.067
Father education: University	0.399	0.388	0.411	0.462	0.047
Mother Education: University	0.403	0.387	0.421	0.286	0.069
Joint test				0.000	
Observations	1,003	522	481		

Notes: This table reports characteristics of all tutors (column 1), tutors in TOP 2020 (column 2), and tutors in TOP 2022 (column 3). P-values for difference in means between the two editions are reported in column (4). The standardized difference between group averages is reported in column (5). For TOP 2020, we selected a limited number of tutors among the applicants considering the subject and time availability. For TOP 2022, we assigned all available volunteers. The second to last row shows the P-value of an F-test for the joint significance of all the coefficients in a regression of a binary indicator equal to one if the tutor participated in TOP 2022 on all the covariates in the table.

Table A.10. Balance Table for Tutors in TOP 2020

	(1) Control	(2) Treatment	(3) 3h Tutoring	(4) 6h Tutoring	(5) P-value (1)-(2)	(6) P-value (1)-(3)	(7) P-value (3)-(4)
Female	0.718	0.701	0.690	0.730	0.277	0.606	0.280
GPA	26.366	26.010	26.400	24.954	0.803	0.833	0.405
Tutoring experience	5.331	5.080	5.155	4.879	0.974	0.964	0.871
Volunteering experience	0.777	0.822	0.816	0.837	0.994	0.998	0.991
Motivation TOP: help others	0.783	0.831	0.845	0.794	0.008	0.021	0.807
Major: Economics	0.308	0.285	0.325	0.177	0.663	0.908	0.494
Major: Education	0.058	0.065	0.055	0.092	0.208	0.355	0.655
Major: STEM	0.158	0.337	0.357	0.284	0.003	0.009	0.939
Undergraduate Degree	0.509	0.473	0.496	0.411	0.407	0.876	0.166
Younger siblings	0.502	0.548	0.554	0.532	0.838	0.551	0.343
Mother education: University	0.420	0.385	0.399	0.348	0.789	0.814	0.991
Father education: University	0.399	0.385	0.383	0.390	0.181	0.413	0.374
Joint test					0.000	0.000	0.000
Observations	1,534	522	381	141			

Notes: This table reports characteristics of tutors in the control group (column 1), and assigned to a tutee in TOP 2020 (column 2). Column (3) and (4) splits the sample between the tutors that self-selected to volunteer for 3 hours per week or 6 hours. P-values for difference in means, controlling for the randomization conditions (subject and time availability, previous training and tutoring experience), are reported in column (5). The p-values for the coefficient "Treatment" and "Treatment Intense" are reported in columns (6) and (7), respectively. The second to last row shows the P-value of an F-test for the joint significance of all the coefficients in a regression respectively of the treatment (5) the 3 hours treatment (6), the six hours treatment (7) on all the covariates in the table and randomization round FE.

Table A.11. Balance Table for Tutors in TOP 2022

	(1) Treatment	(2) Individual Tutoring	(3) Group Tutoring	(4) P-value (2)-(3)
Female	0.736	0.731	0.748	0.696
Immigrant	0.097	0.101	0.087	0.640
GPA	26.380	26.321	26.527	0.470
Volunteering experience	0.719	0.725	0.705	0.660
Tutoring experience	0.778	0.775	0.784	0.823
Tutor's motivation: wants to help / be useful	0.555	0.535	0.604	0.163
Major: Economics	0.291	0.269	0.345	0.105
Major: Education	0.021	0.023	0.014	0.490
Major: STEM	0.266	0.260	0.281	0.651
Undergraduate Degree	0.582	0.594	0.554	0.428
Younger siblings	0.644	0.633	0.672	0.645
Father education: University	0.411	0.418	0.394	0.637
Mother Education: University	0.421	0.408	0.453	0.372
Joint test				0.979
Observations	481	342	139	

Notes: This table reports characteristics of tutors in the treatment group in TOP 2022 (column 1), and among those self-selected for individual and group tutoring (column 2 and 3). P-values for difference in means between tutors in the individual and group tutoring are reported in column (4). The second to last row shows the P-value of an F-test for the joint significance of all the coefficients in a regression of the Group treatment on all the covariates in the table and randomization round FE.

Table A.12. Summary statistics of main outcome variables

	TOP 2020			TOP 2022		
	Obs	Mean	S.D.	Obs	Mean	S.D.
Section I: Academic Outcomes						
Performance Index	711	0.14	1.04	943	0.10	0.96
Grade Math Endline	1058	6.40	1.09	1121	6.03	0.98
Fail Math Endline	1058	0.16	0.37	1121	0.28	0.45
Std Performance Math	712	0.10	1.03	953	0.09	0.96
Section II: Aspirations						
Std Aspirations Index	523	0.07	1.00	889	0.03	1.02
Outcomes reported by Students						
Aspirations University	674	0.39	0.49	961	0.32	0.47
Self-efficacy University	682	0.24	0.42	965	0.26	0.44
High-school: vocational	681	0.28	0.45	966	0.22	0.41
High-school: top tier	681	0.15	0.36	966	0.15	0.36
Outcomes reported by Parents						
Aspirations University	765	0.35	0.48	1000	0.28	0.45
Self-efficacy: university	772	0.33	0.47	1002	0.36	0.48
Outcomes reported by Teachers						
Aspirations University	839	0.14	0.34	1076	0.05	0.23
Section III: Socio-Emotional Skills						
Std Socio-emotional Index	636	0.07	0.95	898	-0.01	1.02
Outcomes reported by Students						
Logic task: difficult	685	0.59	0.49	967	0.56	0.50
Logic task: give-up	685	0.12	0.32	967	0.13	0.34
Grit	673	0.69	0.13	958	0.66	0.13
Locus of control	685	0.72	0.11	961	0.70	0.11
Outcomes reported by Parents						
Grit	736	0.67	0.13	955	0.65	0.13
Section IV: Well-being						
Std Well-being Index	614	0.10	0.95	881	0.01	1.05
Outcomes reported by Students						
Depression	669	0.54	0.12	948	0.58	0.12
Happiness	665	0.63	0.22	955	0.69	0.21
Outcomes reported by Parents						
Depression	731	0.58	0.10	968	0.58	0.10
Happiness	741	0.62	0.21	969	0.68	0.18

Notes: This table shows the summary statistics of all outcome variables for TOP 2020 (columns 1-3) and TOP 2022 (columns 4-6), as reported in the administrative data for grades and failure rate or endline questionnaire from students, parents, and teachers for the other variables. All outcomes refer to children even when reported by parents or teachers. The table also includes the mean of the indices in the entire sample, standardized to have mean 0 and standard deviation 1 for the control group.

Table A.13. Estimation of the impact of TOP 2020 on academic outcomes and beliefs

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Regression Model 1			Regression Model 2					
	Treatment	SE	q-value	Treatment	SE	Intense	SE	Mean Dep	Obs
Outcomes									
Panel A: Italian									
Grade	0.076	(0.050)	[0.078]	0.051	(0.055)	0.076	(0.080)	6.49	1057
Fail	-0.017	(0.017)	[0.171]	-0.013	(0.018)	-0.013	(0.025)	0.08	1057
Std Test Score Endline	0.174	(0.078)	[0.033]	0.142	(0.083)	0.115	(0.118)	0.00	712
Std Test Score Follow-up	0.105	(0.096)	[0.160]	0.051	(0.103)	0.201	(0.149)	-0.00	342
Panel B: English									
Grade	0.004	(0.059)	[0.419]	0.002	(0.063)	-0.010	(0.100)	6.55	1058
Fail	-0.013	(0.019)	[0.237]	-0.008	(0.020)	-0.018	(0.032)	0.12	1058
Std Test Score Endline	0.195	(0.086)	[0.033]	0.093	(0.091)	0.339	(0.128)	0.00	515
Std Test Score Follow-up	0.050	(0.092)	[0.244]	0.009	(0.099)	0.149	(0.152)	-0.00	343
Panel C: Beliefs									
Students									
Beliefs on math test score	0.034	(0.014)	[0.030]	0.028	(0.015)	0.020	(0.021)	0.66	704
Beliefs on all test score	0.033	(0.012)	[0.020]	0.030	(0.012)	0.011	(0.018)	0.65	705
Beliefs on grade	0.292	(0.104)	[0.020]	0.324	(0.110)	-0.105	(0.157)	6.15	680
Parents									
Beliefs on math test score	0.030	(0.013)	[0.033]	0.029	(0.014)	0.003	(0.019)	0.67	746
Beliefs on all test score	0.024	(0.010)	[0.030]	0.194	(0.011)	-0.007	(0.015)	0.69	756
Teachers									
Beliefs on math test score	0.236	(0.097)	[0.030]	0.047	(0.104)	0.140	(0.144)	4.61	704
Beliefs on all test score	0.045	(0.014)	[0.012]	0.047	(0.014)	-0.010	(0.022)	0.48	792
Beliefs on grade	0.045	(0.123)	[0.012]	0.360	(0.129)	0.074	(0.214)	5.49	792

Notes: OLS estimates, robust standard errors in parentheses, and Anderson sharpened q-values in square brackets. The dependent variable is defined in the left column. "Treatment" is an indicator for being assigned a tutor; "Intense" is an indicator for being assigned to 6 hours of tutoring. Columns (1) and (2) report the coefficients and standard errors of our main specification. Columns (4), (5), (6), and (7) report the coefficients and standard errors of the regression model including both "Treatment" and "Intense treatment" as independent variables, controlling for whether the students was identified for intense tutoring (coefficient not shown). Controls included in all regressions: parental education and occupation, gender, immigration status, learning disorders, school grade, teacher-assigned grades, SES status, and test scores in math at baseline. "Mean Dep" is the mean of the dependent variable at endline for students in the control group.

Table A.14. Estimation of the impact of TOP 2022 on academic outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Regression Model 1			Regression Model 2					
	Treatment	SE	q-value	Treatment	SE	Group	SE	Mean Dep	Obs
Outcomes									
Panel A: Italian									
Grade	0.021	(0.045)	[0.861]	0.013	(0.054)	0.019	(0.066)	6.36	1121
Fail	0.001	(0.019)	[1.000]	0.003	(0.023)	-0.005	(0.028)	0.10	1121
Std Test Score Endline	0.043	(0.065)	[0.807]	0.146	(0.076)	-0.244	(0.094)	-0.00	952
Panel B: English									
Grade	0.090	(0.060)	[0.416]	0.079	(0.069)	0.025	(0.087)	6.44	1121
Fail	-0.060	(0.021)	[0.031]	-0.061	(0.023)	0.003	(0.027)	0.16	1121
Std Test Score Endline	0.083	(0.062)	[0.450]	0.122	(0.074)	-0.092	(0.087)	0.00	951
Panel C: Beliefs									
Students									
Belief on math test score	0.008	(0.013)	[0.807]	0.016	(0.016)	-0.019	(0.019)	0.64	946
Belief on own test score	0.006	(0.010)	[0.807]	0.018	(0.012)	-0.028	(0.015)	0.66	945
Belief on grade	-0.025	(0.110)	[1.000]	-0.090	(0.131)	0.157	(0.164)	5.54	955
Parents									
Belief on math test score	0.013	(0.013)	[0.717]	0.013	(0.015)	-0.001	(0.018)	0.63	998
Belief on test score	0.001	(0.009)	[1.000]	-0.004	(0.010)	0.011	(0.013)	0.69	995
Teachers									
Belief on math test score	0.040	(0.014)	[0.031]	0.046	(0.016)	-0.013	(0.020)	0.48	821
Belief on test score	0.015	(0.009)	[0.322]	0.014	(0.010)	0.003	(0.013)	0.53	1068
Belief on grade	0.179	(0.086)	[0.180]	0.222	(0.101)	-0.102	(0.122)	5.43	1081

Notes: OLS estimates, robust standard errors in parentheses, and Anderson sharpened q-values in square brackets. The dependent variable is defined in the left column. "Treatment" is an indicator for being assigned a tutor; "Group" is an indicator for being assigned to group tutoring. Columns (1) and (2) report the coefficients and standard errors of our main specification. Columns (4), (5), (6), and (7) report the coefficients and standard errors of the regression model including both "Treatment" and "Group" as independent variables. Controls included in all regressions: parental education and occupation, gender, immigration status, learning disorders, school grade, teacher-assigned grades, SES status, and test scores in math at baseline. "Mean Dep" is the mean of the dependent variable at endline for students in the control group.

Table A.15. Estimation of the impact of TOP2020 and TOP2022 on instruction time

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Regression Model 1			Regression Model 2					
Outcomes									
Panel A: TOP2020	Treatment	SE	q-value	Treatment	SE	Intense	SE	Mean Dep	Obs
Homework time									
Minutes per day reported by students	9.968	(3.491)	[0.004]	6.794	(3.745)	12.190	(4.998)	88.26	690
Minutes per day reported by parents	8.672	(2.782)	[0.003]	5.952	(3.006)	10.941	(4.030)	81.71	778
Always homework reported by teachers	0.106	(0.032)	[0.003]	0.102	(0.034)	-0.003	(0.052)	0.28	851
Online classes									
Always follows reported by students	0.023	(0.029)	[0.203]	0.032	(0.031)	-0.031	(0.043)	0.83	687
Always follows reported by parents	-0.003	(0.024)	[0.432]	0.006	(0.025)	-0.031	(0.038)	0.88	777
Always follows reported by teachers	0.108	(0.032)	[0.003]	0.099	(0.035)	0.030	(0.050)	0.57	859
Panel B: TOP2022	Treatment	SE	q-value	Treatment	SE	Group	SE	Mean Dep	Obs
Homework time									
Minutes per day reported by students	4.213	(2.926)	[0.291]	4.343	(3.398)	-0.313	(4.048)	80.60	967
Minutes per day reported by parents	3.418	(2.988)	[0.291]	3.593	(3.447)	-0.416	(4.123)	83.43	1004
Always homework reported by teachers	-0.041	(0.024)	[0.291]	-0.028	(0.028)	-0.031	(0.032)	0.20	1081

Notes: OLS estimates, robust standard errors in parentheses, and Anderson sharpened q-values in square brackets. The dependent variable is defined in the left column. "Treatment" is an indicator for being assigned a tutor; "Intense" is an indicator for being assigned to 6 hours of tutoring. "Group" is an indicator for being assigned to group tutoring. Columns (1) and (2) report the coefficients and standard errors of our main specification. In Panel A, columns (4), (5), (6), and (7) report the coefficients and standard errors of the regression model including both "Treatment" and "Intense treatment" as independent variables for TOP2020, controlling for whether the students was identified for intense tutoring (coefficient not shown). In Panel B, columns (4), (5), (6), and (7) report the coefficients and standard errors of the regression model including both "Treatment" and 'Group" as independent variables for TOP2022. Controls included in all regressions: parental education and occupation, gender, immigration status, learning disorders, school grade, teacher-assigned grades, SES status, and test scores in math at baseline. "Mean Dep" is the mean of the dependent variable at endline for students in the control group.

Table A.16. Estimation of the impact of Intense Tutoring in TOP2020 on instruction time

	(1)	(2)	(3)	(4)
	Regression Model			
	Intense	SE	Mean Dep	Obs
Tutoring time (from tutor registry)				
Share of sessions that took place as planned	0.002	(0.016)	0.911	504
Session duration (in minutes)	15.776	(2.097)	67.936	502
Share of sessions planned after the end of school day	-0.029	(0.021)	0.874	502
Share of sessions planned on weekends	0.023	(0.012)	0.067	502
Number of sessions planned	4.317	(0.687)	14.598	504
Number of sessions	3.669	(0.631)	13.321	504
Total time of meetings (in minutes)	511.333	(50.662)	882.451	504
Coverage of meetings (in days)	0.237	(0.895)	36.361	502
Number of sessions per week	0.664	(0.093)	2.345	502

Notes: OLS estimates, robust standard errors in parentheses. The dependent variable is defined in the left column. "Intense" is an indicator for being assigned to 6 hours of tutoring. Columns (1) and (2) report the coefficients and standard errors of the regression model including "Intense treatment" as independent variable for TOP2020, controlling for whether the students was identified for intense tutoring (coefficient not shown). Controls included in all regressions: parental education and occupation, gender, immigration status, learning disorders, school grade, teacher-assigned grades, SES status, and test scores in math at baseline. "Mean Dep" is the mean of the dependent variable at endline for students in the 3-hours treatment group.

Table A.17. Estimation of the impact of TOP 2020 on non academic outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Regression Model 1			Regression Model 2					
	Treatment	SE	q-value	Treatment	SE	Intense	SE	Mean Dep	Obs
Outcomes									
Panel A: Aspirations									
Students									
Aspirations University	0.062	(0.037)	[0.230]	0.033	(0.039)	0.109	(0.055)	0.36	674
Self-efficacy university	0.040	(0.032)	[0.230]	0.053	(0.036)	-0.047	(0.047)	0.21	682
High-school: vocational	-0.058	(0.034)	[0.230]	-0.047	(0.036)	-0.039	(0.049)	0.30	681
High-school: top tier	-0.000	(0.027)	[0.332]	-0.016	(0.028)	0.059	(0.040)	0.16	681
Parents									
Aspirations University	0.042	(0.033)	[0.230]	0.034	(0.036)	0.033	(0.050)	0.34	765
Self-efficacy university	0.080	(0.032)	[0.106]	0.081	(0.035)	0.000	(0.048)	0.29	772
Teachers									
Aspirations University	0.029	(0.022)	[0.230]	0.020	(0.024)	0.021	(0.037)	0.14	839
Panel B: Socio-emotional skills									
Students									
Logic task: difficult	0.048	(0.037)	[0.230]	0.007	(0.040)	0.153	(0.054)	0.56	685
Logic task: give-up	-0.034	(0.026)	[0.230]	-0.038	(0.027)	0.018	(0.037)	0.14	685
Grit	0.015	(0.010)	[0.230]	0.016	(0.011)	-0.004	(0.015)	0.68	673
Locus of control	0.023	(0.009)	[0.106]	0.022	(0.009)	0.004	(0.012)	0.71	685
Parents									
Grit	-0.006	(0.010)	[0.332]	-0.002	(0.010)	-0.015	(0.015)	0.67	736
Panel C: Psychological well-being									
Students									
Depression	-0.018	(0.009)	[0.182]	-0.016	(0.010)	-0.008	(0.014)	0.55	669
Happiness	0.025	(0.017)	[0.230]	0.023	(0.018)	0.005	(0.026)	0.61	665
Parents									
Depression	-0.011	(0.008)	[0.230]	-0.009	(0.008)	-0.008	(0.012)	0.59	731
Happiness	0.035	(0.016)	[0.156]	0.032	(0.017)	0.011	(0.022)	0.60	741

Notes: OLS estimates, robust standard errors in parentheses, and Anderson sharpened q-values in square brackets. The dependent variable is defined in the left column. "Treatment" is an indicator for being assigned a tutor; "Intense treatment" is an indicator for being assigned to 6 hours of tutoring. Columns (1) and (2) report the coefficients and standard errors of our baseline specification. Columns (4), (5), (6), and (7) report the coefficients and standard errors of the regression model including both "Treatment" and "Intense treatment" as independent variables, controlling for whether the students was identified for intense tutoring (coefficient not shown). Controls included in all regressions: parental education and occupation, gender, immigration status, learning disorders, school grade, teacher-assigned grades, SES status, and test scores in math at baseline. "Mean Dep" is the mean of the dependent variable at endline for students in the control group.

Table A.18. Estimation of the impact of TOP 2022 on other non academic outcomes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Regression Model 1			Regression Model 2					
	Treatment	SE	q-value	Treatment	SE	Group	SE	Mean Dep	Obs
Outcomes									
Panel A: Aspirations									
Students									
Aspirations university	0.022	(0.030)	[1.000]	0.004	(0.035)	0.042	(0.042)	0.31	961
Self-efficacy university	0.000	(0.029)	[1.000]	-0.001	(0.034)	0.003	(0.040)	0.26	965
High-school: vocational	-0.031	(0.027)	[1.000]	-0.023	(0.031)	-0.018	(0.038)	0.24	966
High-school: top tier	0.038	(0.023)	[1.000]	0.032	(0.027)	0.012	(0.034)	0.13	966
Parents									
Aspirations university	0.031	(0.028)	[1.000]	0.028	(0.033)	0.008	(0.039)	0.27	1000
Self-efficacy university	-0.002	(0.030)	[1.000]	0.002	(0.035)	-0.009	(0.043)	0.36	1002
Teachers									
Aspirations university	-0.007	(0.014)	[1.000]	-0.018	(0.016)	0.025	(0.019)	0.06	1076
Panel B: Socio-emotional skills									
Students									
Logic task: difficult	-0.011	(0.034)	[1.000]	-0.004	(0.039)	-0.017	(0.047)	0.56	967
Logic task: give-up	0.007	(0.023)	[1.000]	0.002	(0.026)	0.011	(0.031)	0.13	967
Grit	-0.009	(0.009)	[1.000]	-0.016	(0.010)	0.018	(0.013)	0.66	958
Locus of control	0.007	(0.008)	[1.000]	0.009	(0.009)	-0.004	(0.011)	0.70	961
Parents									
Grit	-0.008	(0.008)	[1.000]	-0.012	(0.009)	0.008	(0.012)	0.65	955
Panel C: Psychological well-being									
Students									
Depression	-0.006	(0.008)	[1.000]	-0.001	(0.009)	-0.011	(0.011)	0.58	948
Happiness	0.008	(0.014)	[1.000]	0.003	(0.016)	0.013	(0.020)	0.69	955
Parents									
Depression	-0.003	(0.007)	[1.000]	-0.001	(0.008)	-0.005	(0.010)	0.59	968
Happiness	0.001	(0.012)	[1.000]	0.001	(0.014)	0.001	(0.017)	0.68	969

Notes: OLS estimates, robust standard errors in parentheses, and Anderson sharpened q-values in square brackets. The dependent variable is defined in the left column. "Treatment" is an indicator for being assigned a tutor; "Group" is an indicator for being assigned to group tutoring. Columns (1) and (2) report the coefficients and standard errors of our baseline specification. Columns (4), (5), (6), and (7) report the coefficients and standard errors of the regression model including both "Treatment" and 'Group" as independent variables. Controls included in all regressions: parental education and occupation, gender, immigration status, learning disorders, school grade, teacher-assigned grades, SES status, and test scores in math at baseline. "Mean Dep" is the mean of the dependent variable at endline for students in the control group.

Table A.19. Treatment Effect on Tutors

	(1)	(2)	(3)	(4)	(5)	(6)
	Income as Incentive vs. Income equality	Hard work vs. Luck	Work to Natives over Immigrants	If Effort Well-paid job	Easy to put in others' shoes	Make decisions irrespective others' feelings
Tutors	0.148	0.122	0.337	-0.259	0.486	-0.194
	(0.196)	(0.200)	(0.232)	(0.222)	(0.239)	(0.229)
Mean Dep:	4.46	3.47	1.81	2.98	3.15	2.79
Obs	738	741	737	737	739	739

Notes: Coefficients from ordered logit regressions. The randomization controls include whether the volunteer has tutoring experience and specific training (to support students with learning disorders or immigrants), their expertise in the subjects (math, Italian, English), their time availability (3 hours per week or 6 hours per week), whether they are on time in their university enrollment and if they confirmed their availability. The additional tutor controls include gender, university faculty, whether they are enrolled in a undergraduate or master, GPA, previous volunteering activities, whether they applied to TOP to help others (motivation), parental education, and familiarity with the computer. "Mean Dep" is the mean of the dependent variable for students in the control group.

B Data Appendix

B1 Description of outcome variables

Test score. One of our main outcomes of interest is student learning. In normal years, standardized test scores are collected in May/June from all Italian students in grade 8 by the Institute for the Evaluation of the Italian Schooling System (INVALSI). However, due to the pandemic, these tests were not administered in 2020. In collaboration with two expert middle school teachers, we designed a (shorter) standardized test very close in format to the national standardized one. We use the same procedure in TOP 2020 and TOP 2022 to collect test scores from all students in the sample in grade 6, 7, and 8.

The test was administered to treatment and control students by enumerators. The research team sent to each student the link to complete the test score, but they needed a password to access it. The enumerator called each parent to set a time for the test. During the test, the student was on a video call with the enumerator, he/she opened the link with the questionnaire in his/her own device and entered the password given in real time by the enumerator: at that point, the test could start. Enumerators were clearly instructed *not* to help children during the test. Once the student completed and submitted the test online, the enumerators were available to discuss any doubts and answer potential questions.

By design, during the course of our program, TOP tutors did not follow a specific curriculum but they helped students with the homework assigned by school teachers. For this reason, the test we administered covered the basic achievement expected from students of each grade. The assessment covered a wide range of competencies and very few students reached a ceiling in terms of correct answers.

The variable used in the paper is constructing by standardizing the average number of correct answers to have mean 0 and standard deviation 1 in the control group for each edition of the program. Some examples of questions are reported in Appendix B2.

Performance, aspiration, socio-emotional and well-being indexes. For each edition of TOP, we take the first principal component to reduce the dimensionality and preserve the maximum amount of information. For the performance index, we include in polychoric principal component analysis (PCA) the teacher-assigned grade, failure rate, and standardized test score. The list of questions used for the other indexes is available in Appendix B3, B4, and B5. After the PCA, we standardize the outcome to have mean 0 and standard deviation 1 in the control group for each edition of the program.

Empathy and hard work indexes. For each index, we calculate a weighted average of the answer to the questions reported in Appendix B6. We standardize the outcome to have mean 0 and standard deviation 1 in the control group.

B2 Achievement test

- **Example of math question for grade 8:** a is a odd number grater than 3. Which of the following expression represents the first odd number following a?
  - a+1

  - 2a+1
  - 2a-1
  - a+2

- **Example of Italian question for grade 8:** which of the following words corresponds to the grammar analysis: name, male, singular, derivative
  - Libreria
  - Libresco
  - Libraio
  - Libricini

- **Example of English question for grade 8:** Correct the following sentence: "You go to the swimming pool in Sunday".
  - You go the swimming pool in Sunday
  - You goes to the swimming pool in Sunday
  - You go to the swimming pool on Sunday
  - You go on swimming pool on Sunday

B3 Student questionnaire

- **Beliefs on academic outcomes:**
  - **Self-grade** Overall, considering your school performance in all assignments (homework, oral test, written test) in the month of May, how would you rate yourself compared to your classmates for each of the following subjects (Math/Italian/English)? Consider a scale from 1 to 10, where 10 are the high-performing students (top 2-3 students) in the class and 1 are the low-performing students in the class (bottom 2-3 students).
  - **Beliefs on academic outcomes:** How many questions do you expect to have answer correctly in MATH/ITALIAN/ENGLISH?

- **Aspirations:**
  - **Education Goals.** Thinking about your future, how long do you think you will continue to study? Multiple choice options: (1) I think I will start working as soon as I complete this school (2) I think I will continue studying and enroll in high school, and start working after obtaining a diploma (3) I think I will continue studying and enroll in a technical institute, and start working after obtaining a diploma (4) I think I will continue studying and enroll in a professional/vocational institute (such as cosmetology, auto mechanic, etc.) and then start working (5) I think I will continue studying and reach university.

- **High-school goal.** Which high-school would you like to do? Up to two choices are possible. Multiple choice options with all sub-tracks of high school including the two top tier tracks (humanistic and scientific) and vocational high-school
- **Self-efficacy.** Apart from what you would like to do in the future, do you think you will be able to go to university when you are older if you wish to do so? Multiple choice options: (1) Very much (2) Much (3) Somewhat (4) Slightly (5) Not at all

- **Socio-emotional skills:**
  - **Perseverance.** First, we ask students to answer a first logic question. Second, if they want to persevere, we ask them a second logic question.
    - Would you like to try and answer another logic question? Multiple choice options: (1) Yes, I'd like to try with a question as difficult as this one (2) Yes, but I'd like to try an easier question (3) No
  - **Grit (following Duckworth and Quinn (2009)).** Here are a number of statements that may or may not apply to you. There are no right or wrong answers, so please answer truthfully, considering how you compare to most people. (5-points likert scale)
    1. I like schoolwork best which makes me think hard, even if I make a lot of mistakes.
    2. Setbacks discourage me.
    3. If I think I will lose in a game, I do not want to continue playing.
    4. If I set a goal and see that it's harder than I thought I easily lose interest.
    5. When I receive a bad result on a test I spend less time on this subject and focus on other subjects that I'm actually good at.
    6. I work hard in tasks.
    7. I prefer easy homework where I can easily answer all questions correctly.
    8. If I'm having difficulty in a task, it is a waste of time to keep trying. I move on to things which I am better at doing.
  - **Locus of control.** For each of the following statements, give a score from 1 to 5 indicating whether you agree or disagree with the statement.
    1. Many of the unhappy things in people's lives are partly due to bad luck
    2. Trusting in fate has turned out better for me than making a decision to take a definite course of action.
    3. In the case of the well-prepared student, there is rarely, if ever, such a thing as an unfair test.
    4. When I make plans, I am almost certain that I can make them work

- **Well-being:**

- **Depression (following Frühe et al. (2012)).** For each item please mark whether you agree or disagree with the statement. (4 points likert scale)
  1. I am happy
  2. I worry a lot
  3. I feel sad
  4. I get upset quickly
  5. I am not in the mood for anything
  6. I often think I did something wrong
  7. It's often hard for me to concentrate
  8. I feel lonely
  9. I enjoy a lot of things
- **Happiness.** Think about the period of lockdown during Covid-19. During this period, how happy or unhappy have you been overall? 1-10 scale going from very unhappy to very happy

- **Additional outcomes:**
  - **Homework.** Think about the month of May this year. On average, how much time did you devote to doing homework every day? Multiple choice options: (1) Less than 15 minutes (2) 15 30 minutes (3) 30 - 60 minutes (4) 1 hour - 1 hour and a half (5) 1 hour and a half - 2 hours (6) 2 hours - 2 hours and a half (7) More than 2 hours and a half
  - **Following online classes.** In the month of May, have you been following classes online? Multiple choice options: (1) Yes, everytime there was an online class (2) Yes, but not always (3) Sometimes (4) No.
  - **Like subjects** How much do you like the following subjects (Math/Italian/English)? Check one box for each subject. Multiple choice options: Very much/ Much/ Somewhat/ Slightly/ Not at all
  - **Difficult online classes.** How difficult do you find it to follow classes online and use your school's online platform during the month of May? Multiple choice options: Extremely difficult /Very difficult / Moderately difficult /Slightly difficult / Not at all difficult

- **Tutoring experience and satisfaction:** we included few questions only for treated students.

B4 Parent questionnaire

- **Beliefs on academic outcomes.** As part of the final questionnaire for the project, we will ask your child 7 (7/5) questions in math (Italian/English). These are multiple choice questions prepared by middle school teachers that collaborate with us. How many correct answers do you expect your child to get? We will not share your answers with your child.

- **Aspirations:**
  - **Education Goals.** Thinking about your child's future, how long do you think he/she will continue to study? Multiple choice options: (1) I think he/she should start working as soon as he/she completes compulsory schooling (2)I think he/she should continue studying and enroll in high school, and start working after obtaining a diploma (3) I think he/she should continue studying and enroll in a technical institute, and start working after obtaining a diploma (4) I think he/she should continue studying and enroll in a vocational high-school (such as cosmetology, auto mechanic, etc.) and then start working (5) I think he/she should continue studying and reach university.
  - **Self-efficacy.** Do you think your child has the capability to attend and successfully graduate from university if he/she wanted to? Multiple choice options: (1) Very much (2) Much (3) Somewhat (4) Slightly (5) Not at all
- **Socio-emotional skills:**
  - **Grit (following Duckworth and Quinn (2009)).** Here are a number of statements that may or may not apply to your child. There are no right or wrong answers, so please just answer truthfully. Think mainly about your perception from the last month. (5 points likert scale)
    1. He/she likes schoolwork best which makes him/her think hard, even if he/she makes a lot of mistakes.
    2. Setbacks discourage him/her.
    3. If he/she thinks he/she will lose in a game, he/she does not want to continue playing.
    4. If he/she sets a goal and sees that it's harder than he/she thought he/she easily loses interest.
    5. When he/she receives a bad result on a test he/she spends less time on this subject and focuses on other subjects that he/she is actually good at.
    6. He/she works hard in tasks.
    7. He/she prefers easy homework where he/she can easily answer all questions correctly.
    8. If he/she is having difficulty in a task, he/she thinks it is a waste of time to keep trying. He/she moves on to things which he/she is better at doing.
- **Well-being:**
  - **Depression (following Frühe et al. (2012)).** For each item please mark whether you believe the statement is true for your child. (4 points likert scale)
    1. is happy
    2. worries a lot
    3. feels sad

4. gets upset quickly
5. is not in the mood for anything
6. often thinks he/she did something wrong
7. is often hard for him/her to concentrate
8. feels lonely
9. enjoys a lot of things

– **Happiness.** Think about the period of lockdown during Covid-19. During this period, how happy or unhappy would you say your child has been overall?

- **Additional outcomes:**
  - **Homework.** Think about the month of May. On average, how much time did your child devote to studying and doing homework every day? Multiple choice options: (1) Less than 15 minutes (2) 15 30 minutes (3) 30 - 60 minutes (4) 1 hour - 1 hour and a half (5) 1 hour and a half - 2 hours (6) 2 hours - 2 hours and a half (7) More than 2 hours and a half
  - **Following online classes.** In the month of May, did your child follow classes online? Multiple choice options: (1) Yes, everytime there was an online class (2) Yes, but not always (3) Sometimes (4) No .
- **Tutoring experience and satisfaction:** we included few questions only for treated students.

B5 Teacher questionnaire

- **Beliefs on academic outcomes:**
  - **Beliefs on academic outcomes.** As part of the final questionnaire for the project, we will ask 7 (7/5) questions in math (Italian/English). These are multiple choice questions prepared by middle school teachers that collaborate with us. How many correct answers do you expect student X to get? We will not share your answers with your students.
  - **Grade.** Overall, considering the performance of your students in all assignments (homework, oral tests, written tests) in the month of May, how would you rate student X? Consider a scale from 1 to 10, where 10 are the best-performing students (top 2-3 students) in the class and 1 are the least-performing students in the class (bottom 2-3 students).
- **Aspirations:**
  - **Education Goals.** Thinking about the future of the student, how long do you think he/she should continue to study? Multiple choice options: (1) I think he/she should start working as soon as he/she completes compulsory schooling (2)I think he/she should continue studying and enroll in high school, and start

working after obtaining a diploma (3) I think he/she should continue studying and enroll in a technical institute, and start working after obtaining a diploma (4) I think he/she should continue studying and enroll in a vocational high-school (such as cosmetology, auto mechanic, etc.) and then start working (5) I think he/she should continue studying and reach university.

- **Additional outcomes:**
  - **Homework.** Did the student X do his/her homework during the month of May 2020? Multiple choice options: (1)Yes, regularly did all assigned homework (2) Yes, did the assigned homework most of the times, but not always (3) Sometimes/rarely (4) No
- **Tutoring experience and satisfaction:** we included few questions only for treated students.

B6 Tutor questionnaire

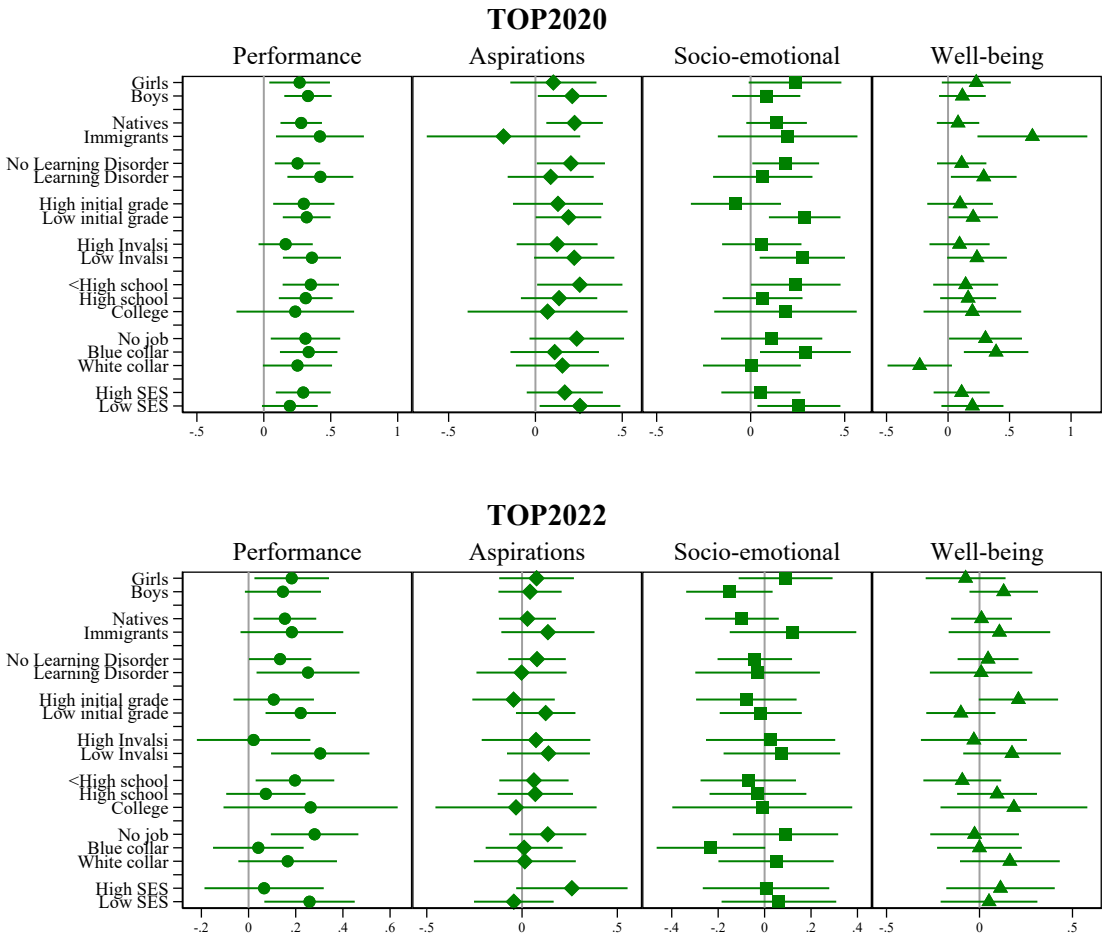
- **Empathy.** Below is a list of statements. Please read each statement carefully and rate how strongly you agree or disagree with it. There are no right or wrong answers. (4-points likert scale)
  1. I find it easy to put myself in somebody else's shoes.
  2. I am able to make decisions without being influenced by people's feelings.
- **Hard work.**
  1. We would like to start by asking your views on a few issues. How would you place your views on this 1-10 scale? 1 means you agree completely with the statement on the left; 10 means you agree completely with the statement on the right; and if your views fall somewhere in between, you can choose any number in between.
     - Incomes should be made more equal vs. We need larger income differences as incentives for individual effort
     - In the long run, hard work usually brings a better life vs. Hard work doesn't generally bring success – it's more a matter of luck and connections
  2. How much do you agree with the following statement? If students put effort in studying, they can get a well-paid job, independent of their family background. (4-points likert scale)
- **Tutoring experience and satisfaction:** we included few questions only for treated tutors.

C Heterogeneous treatment effects

C1 Results on heterogeneous treatment effects

In this Appendix, we discuss the heterogeneity of impacts depending on the characteristics of students and tutors.

Figure C.1. Heterogeneity by student characteristics



Notes: This Figure reports OLS estimates and 95% confidence intervals of the impact of TOP tutoring by student characteristics for TOP 2020 in the top panel and TOP 2022 in the bottom panel. Randomization round fixed effects included in all regressions. Controls included are parental education and occupation, gender, immigration status, learning disorders, school grade, teacher-assigned grades, SES status, and test scores in math at baseline. Each index is standardized to have mean 0 and the standard deviation is 1 in the control group.

Student Characteristics. An important dimension of heterogeneity that may help us to understand the mechanisms through which tutoring affects students' outcomes pertains to student demographics and socioeconomic background. In Figure C.1 we show

the impact of TOP on our aggregate indexes of math performance, aspirations, socio-emotional skills, and psychological well-being for different sub-groups of students, split according to predetermined characteristics: sex, immigrant status, learning disorders, baseline performance in teacher-assigned grades, baseline performance in standardized test scores (Invalsi), mother's education and occupation, and socio-economic status of the household.[1] For each of the four outcomes, the figure shows the estimated impact (relative to the control group) and the associated 95 percent confidence interval.

While the differences across subgroups are not statistically significant in most cases, it appears that the gains in academic performance in both TOP 2020 and TOP 2022 are somewhat more concentrated among students from a disadvantaged background, i.e., immigrants, students with learning disorders, students with lower initial performance, and with lower SES. These are the students who may receive the least support from parents in terms of help with homework, and for whom regular meetings with a tutor may make more of a difference. We observe a similar pattern for socio-emotional skills, which improved relatively more for students with lower initial performance and lower socio-economic status.

When we look at aspirations, the treatment effect appears to be similar across all subgroups – the only result worth mentioning is that in 2020 aspirations increase for natives but not for immigrants, possibly because the latter face different types of barriers when planning their future education, which may have been exacerbated by school closures (Carlana, La Ferrara and Pinotti, 2022*a*).

The outcome for which the heterogeneity in treatment effects is most striking is psychological well-being. When we compare native and immigrant students, it is clear that the increased happiness and reduced depression we detect in TOP 2020 is entirely driven by immigrant students. The magnitude of the effect for this group is a striking 0.69 SD increase in well-being. One possible interpretation is that immigrant students have a less dense network of friendships, hence felt more isolated during the lockdown. In fact, among students in the control group, immigrants have on average a 0.42 SD lower well-being compared to natives in TOP 2020 (p-value =0.03). For TOP 2022, we find a small positive effect on the well-being of immigrant students, although post-pandemic there are no significant differences in the level among immigrant and non-immigrant students in the control group (the difference is +0.11 with a p-value= 0.40).

[1]The socio-economic status (SES) index is constructed by Invalsi considering parental education, occupation, and ownership of relevant resources, such as books, desk, computer, internet connection, and having a quite space to study and a own bedroom.

Table C.I. CLAN of Performance Index

	(1)	(2)	(3)	(4)	(5)	(6)
		TOP 2020			**TOP 2022**	
Variable	Upper quartile	Lower quartile	p-value difference	Upper quartile	Lower quartile	p-value difference
Female	0.385	0.406	0.854	0.479	0.445	0.791
	[0.291,0.484]	[0.302,0.511]		[0.393,0.574]	[0.359,0.539]	
Immigrant	0.191	0.179	0.902	0.39	0.178	0
	[0.112,0.271]	[0.096,0.261]		[0.301,0.478]	[0.109,0.247]	
Learning Disorder	0.32	0.327	0.976	0.251	0.231	0.677
	[0.228,0.415]	[0.227,0.428]		[0.175,0.333]	[0.155,0.307]	
School grade 6	0.335	0.297	0.638	0.318	0.313	0.742
	[0.24,0.431]	[0.202,0.396]		[0.237,0.407]	[0.229,0.397]	
School grade 7	0.361	0.3	0.443	0.364	0.373	0.792
	[0.264,0.46]	[0.199,0.4]		[0.277,0.452]	[0.285,0.46]	
Std INVALSI Math 5	-0.072	0.19	0.042	-0.162	0.004	0.062
	[-0.279,0.117]	[-0.026,0.411]		[-0.256,-0.069]	[-0.124,0.132]	
SES Status	-0.189	-0.329	0.123	-0.454	-0.312	0.064
	[-0.353,-0.042]	[-0.507,-0.136]		[-0.553,-0.345]	[-0.442,-0.191]	
Baseline math grade	6.215	6.081	0.073	6.386	6.449	0.557
	[6.047,6.411]	[5.839,6.302]		[6.203,6.586]	[6.241,6.672]	
Single parent household	0.218	0.236	0.651	0.36	0.145	0
	[0.136,0.301]	[0.143,0.33]		[0.277,0.452]	[0.081,0.209]	
Mother Education: High-school	0.501	0.437	0.381	0.349	0.477	0.056
	[0.403,0.6]	[0.33,0.544]		[0.264,0.435]	[0.39,0.567]	
Mother Education: University	0.127	0.123	0.85	0.144	0.138	0.964
	[0.063,0.195]	[0.053,0.195]		[0.081,0.208]	[0.079,0.203]	
Father Education: High-school	0.412	0.351	0.547	0.306	0.492	0.002
	[0.315,0.51]	[0.252,0.451]		[0.224,0.389]	[0.403,0.582]	
Father Education: University	0.069	0.083	0.78	0.062	0.079	0.553
	[0.017,0.121]	[0.026,0.141]		[0.02,0.105]	[0.031,0.127]	
Mother Occupation: White-collar	0.414	0.421	0.77	0.424	0.376	0.583
	[0.332,0.497]	[0.334,0.509]		[0.353,0.499]	[0.306,0.451]	
Mother Occupation: Blue-collar	0.534	0.538	0.847	0.496	0.578	0.257
	[0.45,0.617]	[0.453,0.626]		[0.42,0.566]	[0.511,0.657]	
Father Occupation: White-collar	0.325	0.334	0.914	0.273	0.377	0.043
	[0.238,0.414]	[0.242,0.424]		[0.208,0.342]	[0.294,0.462]	
Father Occupation: Blue-collar	0.638	0.628	0.827	0.67	0.566	0.098
	[0.548,0.727]	[0.541,0.724]		[0.6,0.74]	[0.481,0.653]	

Notes: The table reports the median CLAN estimates for all covariates over 100 splits. The numbers in columns 1 and 4 (2 and 5) represent the share of individuals with a given characteristic among those belonging to the top (bottom) quartile in terms of impact of the treatment. 90 percent confidence intervals are reported in square brackets. Columns 3 and 6 report the p-value for the hypothesis that the difference between columns (1) and (2) -or between (4) and (5), respectively- is zero.

To complement the above analysis with a more systematic approach, we estimate heterogeneous treatment effects using generic machine learning inference. We follow Chernozhukov et al. (2018) and and apply their method to understand who benefits the most from tutoring. Section C2 of this online appendix describes our methodology in more detail.

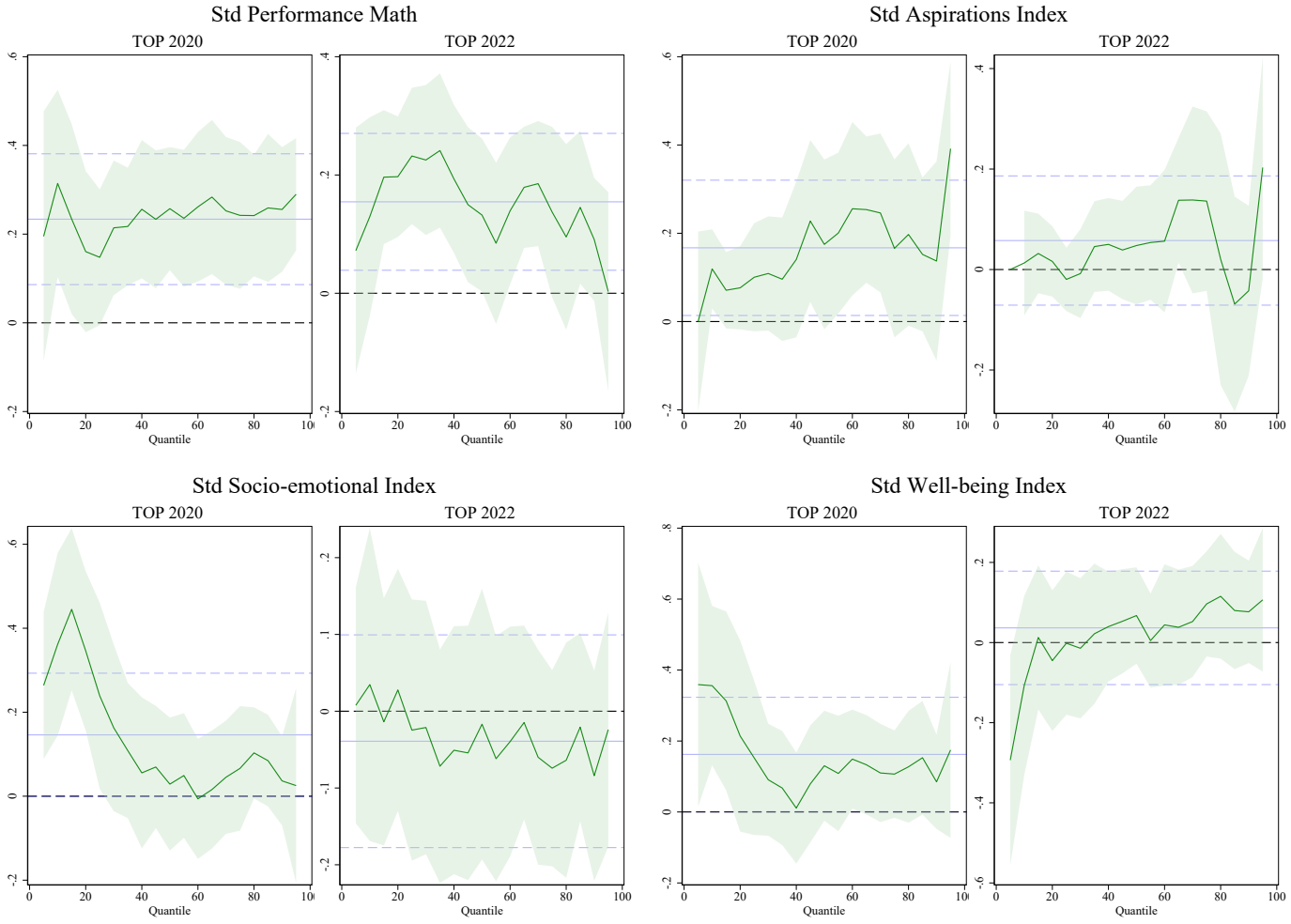
In a nutshell, we do not find strong evidence of heterogeneity in treatment effects. This can be seen by observing the coefficient β_2 in the Best Linear Predictor (BLP) of the Conditional Average Treatment Effect (CATE) in Figure C.4. Nonetheless, to investigate treatment heterogeneity, we also check the predictions on the expected treatment effect for each individual, given the covariates. Table C.I reports the mean of each baseline characteristic for the students in the top and bottom quartile of predicted impact on math performance. Overall, the results are consistent with our previous discussion of Figure C.1. Students who have lower initial standardized test scores (Invalsi) and are from a more disadvantaged background are over-represented among the students with the highest

predicted impact on performance, but most differences are not statistically significant. Tables C.V, C.VI, and C.VII report a similar exercise for the other three outcome indexes. The results show more positive effects for students from lower socio-economic status and with higher initial learning difficulties of all these three 'soft' dimensions in TOP 2020, with particularly striking results for the psychological well-being of immigrants thanks to the support of the tutor.

Finally, Figure C.2 reports the results of the quantile regressions. The pattern is quite interesting: while the impact on academic performance is similar across quantiles in both waves of program implementation, the positive results on socio-emotional and well-being indexes in TOP2020 are driven by the lower quantiles.

Overall, the above results qualitatively suggest that the most disadvantaged children seem to have benefited the most from the tutoring. However, heterogeneity based on parents' or students' characteristics is not stark. To understand why this may be the case, it is worth emphasizing that the sample of students included in TOP had been already selected by school principals and teachers among the ones deemed most in need of the tutoring intervention (that is, from a population that may have overall been similarly disadvantaged). This could account for the low degree of heterogeneity in treatment effects.

Figure C.2. Quantile Regression



Notes: These Figures shows the results of the quantile regression (in green) for each of the main outcomes and editions of the program. Results from a least squares regression with 95% confidence intervals are shown in blue.

Tutor characteristics and match with student characteristics. Next, we investigate whether tutors' characteristics played a significant role in explaining the effects of the program. In Figure C.3 we explore a sets of tutor baseline characteristics: sex, education level of the mother (as a proxy for socioeconomic status), academic performance, and pro-social attitudes. For each of these characteristics, we report the treatment effect on students' outcomes, separately by subgroup of tutor characteristic, as well as the associated 95 percent confidence interval.

The figure shows that male and female tutors are on average equally effective in improving student outcomes. Table C.II further investigates this issue by testing for differential effects depending on combinations of sex of the tutor and of the student. We fail to detect statistically significant pairwise differences: mixed-sex pairs perform slightly better than same-sex ones, but the difference is insignificant, as shown by the p-values in square brackets.

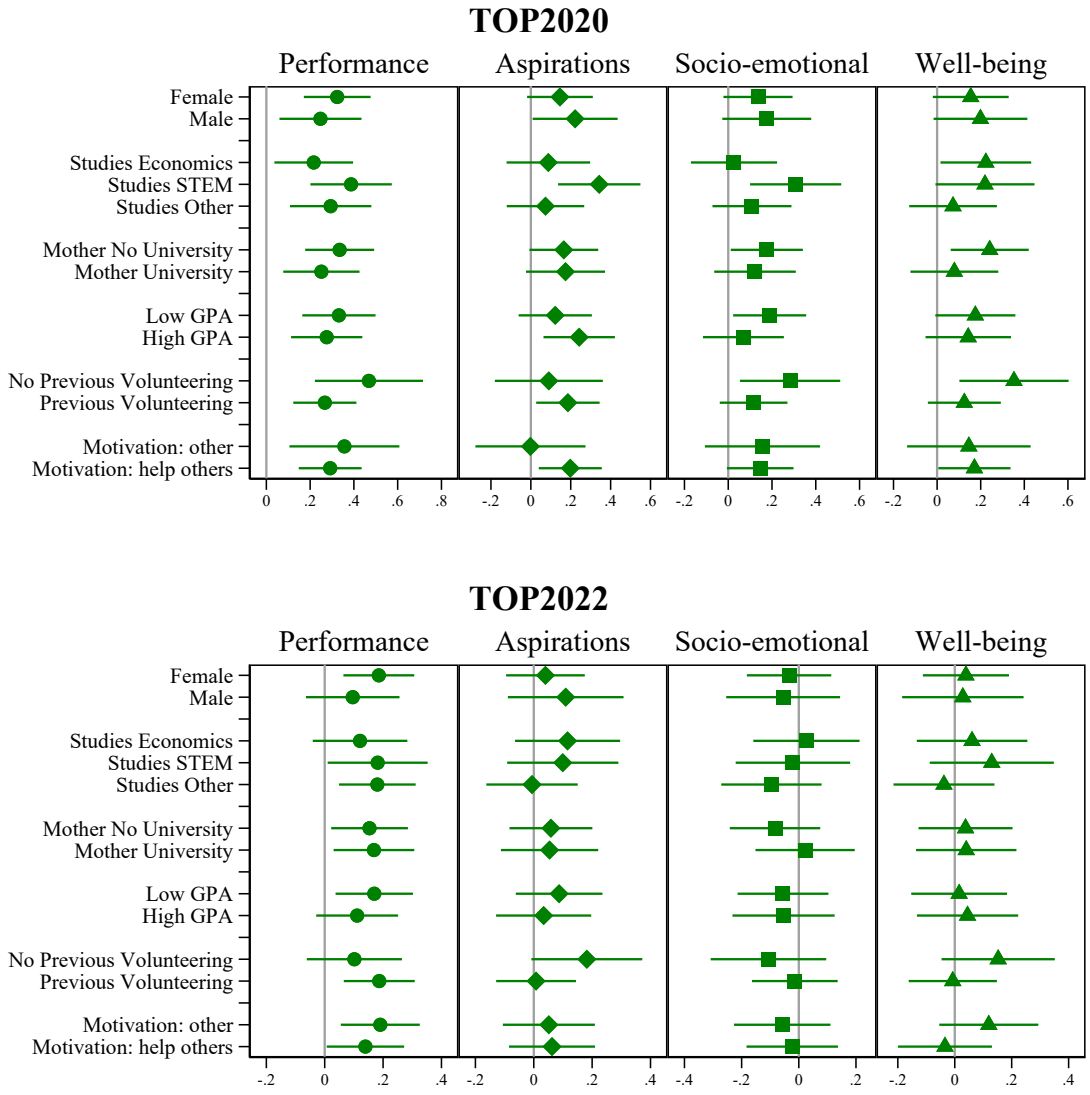
Similarly, in Figure C.3 we do not detect statistically significant differences by tutors' socio-economic status, as proxied by mother's education. Table C.III tests for differential impact by tutor-student socio-economic status match. Overall, the results are not statistically significant with a few notable exceptions. Students with highly educated mothers did not benefit in their socio-emotional development from the interaction with a tutor from low socio-economic background.[2]

In the remaining panels of Figure C.3, we find that tutors' GPA did not significantly affect the impact of the program: treated students benefited equally from interacting with a tutor above or below the median GPA in their faculty.[3] Finally, we capture tutors' pro-social attitudes and motivation. We compare the impact of tutors with and without previous volunteering experience and of tutors who, when asked at baseline what motivated them to participate in TOP, replied that it was to make themselves useful (variable 'Help others'). Note that our tutors are generally highly pro-social: 80 percent had previous experience as a volunteer (82 percent in TOP 2020 and 72 percent 2022), while 70 percent joined TOP to be useful to others (83 percent in TOP 2020 and 56 percent in TOP 2022). For this reason, it is not too surprising that we do not detect significant differences in the outcomes of students who were assigned different types of tutors. The one outcome in which tutors' motivation seems to make a difference is aspirations in TOP 2020, where the positive impact is entirely driven by the more pro-social tutors.

[2]The positive impact on aspirations and well-being in TOP 2020 was driven by low SES students, but not differentially so when matched to a high- vs. a low-SES tutor.

[3]We standardize the GPA within faculty to account for potential differences in grading criteria, number of credits, etc., across programs.

Figure C.3. Heterogeneity by tutor characteristics



Notes: This Figure reports OLS estimates of the assignment to the TOP tutoring treatment by tutor characteristics for TOP 2020 students in the top panel and TOP 2022 students in the bottom panel. Randomization round fixed effects included in all regressions. Student baseline controls include gender, immigrant, grade, education of each parent, employment type of each parent, and learning disorder. The mean of the control group for each index is 0 and the standard deviation is 1. The bar shows 95% confidence intervals.

Table C.II. Heterogeneity by gender match between tutor and tutee

		(1)	(2)	(3)	(4)
		Performance	Aspirations	Socio-emotional	Wellbeing
Panel A: TOP 2020					
Tutor	**Student**				
Female	Female	0.251	0.049	0.179	0.159
		(0.122)	(0.132)	(0.134)	(0.150))
Male	Male	0.209	0.207	0.037	0.058
		(0.119)	(0.134)	(0.130)	(0.126)
Male	Female	0.307	0.240	0.390	0.427
		(0.155)	(0.180)	(0.169)	(0.199)
Female	Male	0.380	0.215	0.106	0.153
		(0.100)	(0.111)	(0.099)	(0.107)
P-value diff (F, F)-(M, M)		[0.806]	[0.408]	[0.442]	[0.602]
P-value diff (F, F)-(M, F)		[0.699]	[0.254]	[0.192]	[0.147]
P-value diff (F, F)-(F, M)		[0.414]	[0.343]	[0.662]	[0.974]
Observations		709	520	633	611
R^2		0.305	0.333	0.180	0.080
Panel B: TOP 2022					
Tutor	**Student**				
Female	Female	0.194	0.079	0.085	-0.080
		(0.088)	(0.107)	(0.111)	(0.118))
Male	Male	0.048	0.142	-0.190	0.104
		(0.122)	(0.139)	(0.131)	(0.137)
Male	Female	0.152	0.070	0.105	-0.061
		(0.104)	(0.142)	(0.155)	(0.174)
Female	Male	0.178	0.009	-0.138	0.139
		(0.087)	(0.088)	(0.102)	(0.100)
P-value diff (F, F)-(M, M)		[0.337]	[0.720]	[0.105]	[0.304]
P-value diff (F, F)-(M, F)		[0.684]	[0.948]	[0.897]	[0.913]
P-value diff (F, F)-(F, M)		[0.902]	[0.609]	[0.138]	[0.152]
Observations		943	889	898	881
R^2		0.238	0.221	0.063	0.077

Notes: OLS estimates, robust standard errors in parentheses, and p-values in square brackets. The dependent variable is the performance index column 1, the aspiration index in column 2, the socio-emotional index in column 3, and the well-being index in column 4. The first column indicates the gender of the tutor, while the second one the gender of the student. The p-value of the difference between groups is presented at the end of each panel: the first letter refers to the gender of the tutor, while the second letter to the gender of the student (M for male and F for female). For example, (F, M) refers to a female tutor assigned to a male student. Panel A presents the results of TOP 2020, while Panel B of TOP 2022. Controls included in all regressions: parental education and occupation, gender, immigration status, learning disorders, school grade, teacher-assigned grades, SES status, and test scores in math at baseline.

Table C.III. Heterogeneity by SES match between tutor and tutee

		(1)	(2)	(3)	(4)
		Performance	Aspirations	Socio-emotional	Wellbeing
Panel A: TOP 2020					
Mothers' Education					
Tutor	**Student**				
Low	Low	0.379	0.213	0.209	0.167
		(0.089)	(0.106)	(0.097)	(0.106)
High	High	0.164	-0.068	0.281	0.127
		(0.215)	(0.268)	(0.209)	(0.208)
High	Low	0.278	0.203	0.096	0.163
		(0.086)	(0.091)	(0.095)	(0.105)
Low	High	0.161	-0.035	-0.034	0.176
		(0.278)	(0.235)	(0.176)	(0.210)
P-value diff (L, L)-(H, H)		[0.351]	[0.328]	[0.751]	[0.862]
P-value diff (L, L)-(H, L)		[0.255]	[0.927]	[0.267]	[0.970]
P-value diff (L, L)-(L, H)		[0.456]	[0.337]	[0.221]	[0.967]
Observations		711	523	636	614
R^2		0.308	0.337	0.183	0.077
Panel B: TOP 2022					
Mothers' Education					
Tutor	**Student**				
Low	Low	0.196	0.023	-0.068	-0.028
		(0.076)	(0.081)	(0.094)	(0.098)
High	High	0.143	-0.116	0.097	0.337
		(0.190)	(0.212)	(0.190)	(0.195)
High	Low	0.108	0.082	-0.012	0.020
		(0.069)	(0.082)	(0.087)	(0.089)
Low	High	0.377	0.263	-0.231	0.166
		(0.182)	(0.219)	(0.220)	(0.230)
P-value diff (L, L)-(H, H)		[0.796]	[0.537]	[0.431]	[0.090]
P-value diff (L, L)-(H, L)		[0.267]	[0.503]	[0.570]	[0.651]
P-value diff (L, L)-(L, H)		[0.352]	[0.300]	[0.492]	[0.438]
Observations		943	889	898	881
R^2		0.239	0.223	0.062	0.077

Notes: OLS estimates, robust standard errors in parentheses, and p-values in square brackets. The dependent variable is the performance index column 1, the aspiration index in column 2, the socio-emotional index in column 3, and the well-being index in column 4. The first column indicates the soio-economic status of the tutor (high vs. low), while the second one the socio-economic status of the student. The p-value of the difference between groups is presented at the end of each panel: the first letter refers to the SES of the tutor, while the second letter to the SES of the student (H for high and L for low). For example, (H, L) refers to a high-SES tutor assigned to a low-SES student. Panel A presents the results of TOP 2020, while Panel B of TOP 2022. Controls included in all regressions: parental education and occupation, gender, immigration status, learning disorders, school grade, teacher-assigned grades, SES status, and test scores in math at baseline.

C2 Methodology

We assess the treatment heterogeneity following the generic machine learning (ML) inference approach by Chernozhukov et al. (2018) aimed at detecting heterogeneity in the treatment effects with an agnostic procedure. This method focuses on the Best Linear Predictor (BLP) of the Conditional Average Treatment Effects (CATEs) and the Classification Analysis (CLAN) instead of the CATEs themselves to overcome the issues posed by the sparsity requirements in the causal forest method by Wager and Athey (2018)

The outcome variable Y in our analysis are: performance, aspirations, socio-emotional skills, well-being indexes. The dummy D represents the random allocation to TOP tutoring. The variables Z used in the heterogeneity analysis are the following: gender, immigration status, learning disorders, school grade attended (Grade 6, 7 or 8), baseline standardized test score Invalsi in math, socio-economic status measured by Invalsi, baseline teacher-assigned grades, whether the child lives in a single parent household, parental education and occupation.

Following the steps of the algorithm in Chernozhukov et al. (2018), we implement the analysis as follows.

- **Step 1:** We set the number of splits (S= 100), the significance level ($\alpha = 0.05$), and the propensity scores $p(Z)$, which in our case are calculated directly from the RCT design.

- **Step 2:** we set the proportion of the splits at 50% (half form the auxiliary sample N and the remaining half forms the main sample M). Each split follows these steps:

    1. Each of the selected ML methods is tuned and trained separately. We consider the following ML methods: RIDGE, decision tree and support vector machine to estimate $B(Z)$ and $S(Z)$, proxy predictors of b_0 and s_0, given the following specification:

    $$Y = b_0(Z) + Ds_0(Z) + U$$

    2. Estimate the BLP parameters by weighted OLS in the main sample M:

    $$Y_i = \widehat{\alpha}' X_{1i} + \widehat{\beta}_1 \left(D_i - p\left(Z_i\right)\right) + \widehat{\beta}_2 \left(D_i - p\left(Z_i\right)\right) \left(S_i - \mathbb{E}_{N,M} S_i\right) + \widehat{\epsilon}_i, \quad i \in M$$

    such that:

    $\mathbb{E}_{N,M}\left[w\left(Z_i\right)\widehat{\epsilon}_i X_i\right] = 0$ for $X_i = \left[X_{1i}', D_i - p\left(Z_i\right), \left(D_i - p\left(Z_i\right)\right)\left(S_i - \mathbb{E}_{N,M} S_i\right)\right]'$, where $w\left(Z_i\right) = \left\{p\left(Z_i\right)\left(1 - p\left(Z_i\right)\right)\right\}^{-1}$.

    3. We estimate the GATES parameters by weighted OLS in the main sample M:

$$Y_i = \widehat{\alpha}' X_{1i} + \sum_{k=1}^{K} \widehat{\gamma}_k \cdot (D_i - p(Z_i)) \cdot 1(S_i \in I_k) + \widehat{\nu}_i, \quad i \in M$$

Where ℓ_k is the (k/K)-quantile of $\{S_i\}_{i \in M}$. Once again, X_i includes the same controls as the ones described in step 2.

4. We estimate the CLAN parameters in the main sample M:

$$\widehat{\delta}_1 = \mathbb{E}_{N,M}[g(Y_i, Z_i) \mid S_i \in I_1] \quad \text{and} \quad \widehat{\delta}_K = \mathbb{E}_{N,M}[g(Y_i, Z_i) \mid S_i \in I_K]$$

where $I_k = [\ell_{k-1}, \ell_k)$ and ℓ_k is the (k/K)-quantile of $\{S_i\}_{i \in M}$.

5. We compute the two performance measures for the ML methods:

$$\widehat{\Lambda} = \left|\widehat{\beta}_2\right|^2 \widehat{Var}(S(Z)) \quad \widehat{\bar{\Lambda}} = \frac{1}{K} \sum_{k=1}^{K} \widehat{\gamma}_k^2$$

- **Step 3:** We choose the best ML methods based on the medians of $\widehat{\Lambda}$ and $\widehat{\bar{\Lambda}}$.
- **Step 4:** We compute the estimates, $(1-\alpha)$-level conditional confidence intervals and conditional p-values for all the parameters of interest.
- **Step 5:** We compute the adjusted $(1-2\alpha)$-confidence intervals and adjusted p-values using Variational Estimation and Inference Methods (VEIN). These methods take into consideration the two different sources of sampling uncertainty, that is, (i) the estimation uncertainty regarding our estimated parameters, conditional on the data split; (ii) the uncertainty or 'variation' induced by the data splitting (our split into the auxiliary N and the main M sample).

Following the steps described above of the algorithm in Chernozhukov et al. (2018) for each of the four main outcomes, we select the following learners:

Table C.IV. Learners performance

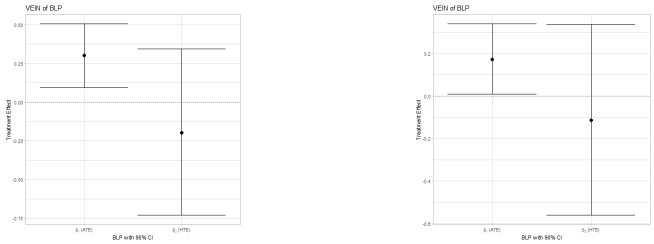
	(1)	(2)	(3)	(4)
	TOP 2020		**TOP 2022**	
Learner	Λ	$\bar{\Lambda}$	Λ	$\bar{\Lambda}$
Performance Index (PPCA)				
RIDGE	0.00236	0.1179	0.00293	0.0509
Decision Tree	0.00534	0.12138	0.00233	0.04753
Support Vector Machine	0.00609	0.12135	0.0035	0.05391
Std Socio-emotional Index				
RIDGE	0.00316	0.04338	0.00239	0.03074
Decision Tree	0.01095	0.05279	0.00607	0.03273
Support Vector Machine	0.00271	0.04652	0.01181	0.03837
Std Well-being Index				
RIDGE	0.01709	0.07202	0.00291	0.03206
Decision Tree	0.0082	0.06032	0.00371	0.03258
Support Vector Machine	0.01254	0.06343	0.00356	0.02916
Std Aspiration Index				
RIDGE	0.00326	0.05903	0.00431	0.0269
Decision Tree	0.00803	0.05655	0.00492	0.02721
Support Vector Machine	0.00813	0.05961	0.01221	0.03998

The BLP results are provided below in Figures C.4. The estimate for the mean prediction $\hat{\beta}_1$ (corresponding to the Average Treatment Effect) match the estimated coefficient of our main analysis, and is statistically significant at the 5 percent level for the performance index in both TOP 2020 and TOP 2022. However, there no clear evidence of heterogeneity in the treatment effects for all outcomes in both waves: none of the coefficients for the differential prediction $\hat{\beta}_2$ is statistically significant.

An analysis of the CLAN results in Tables C.I, C.V, C.VI, and C.VII shows some consistency, with significant differences in the characteristics of the individuals most affected by the intervention as discussed in the main text.

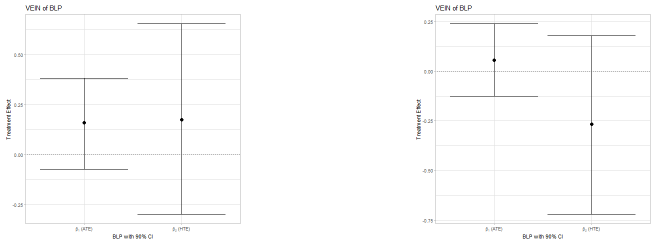
Figure C.4. BLP results for TOP

TOP 2020 TOP 2022



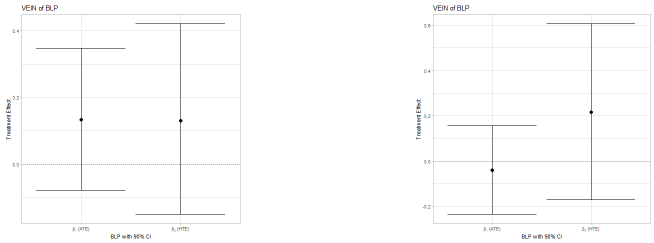
Performance Index (PPCA)

TOP 2020 TOP 2022



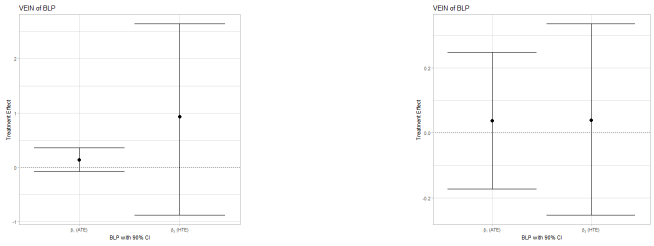
Aspiration Index

TOP 2020 TOP 2022



Socio-emotional Index

TOP 2020 TOP 2022



Well-being Index

Notes: This figure shows the Best Linear Predictor (BLP) of the CATE on the left for TOP 2020 and on the right for TOP 2022 and the GATES analysis of the Generic Machine Learning algorithm on the right for the four main indexes: performance, aspirations, socio-emotional skills, and psychological well-being. In the BLP graphs, $\beta_1(ATE)$ depicts the estimated Average Treatment Effect in the BLP analysis, while $\beta_2(HTE)$ depicts the estimated differential effect. In the GATES graphs, the sample is divided in quartiles based on their heterogeneous treatment effect scores, and the estimated treatment effect is reported for each of the 4 subgroups, including its 95 percent confidence interval.

Table C.V. CLAN of Aspiration Index

	(1)	(2)	(3)	(4)	(5)	(6)
		TOP 2020			**TOP 2022**	
Variable	Upper quartile	Lower quartile	p-value difference	Upper quartile	Lower quartile	p-value difference
Female	0.394	0.47	0.488	0.5	0.415	0.2
	[0.275,0.513]	[0.348,0.591]		[0.407,0.593]	[0.322,0.506]	
Immigrant	0.083	0.176	0.17	0.313	0.261	0.238
	[0.021,0.161]	[0.088,0.276]		[0.226,0.399]	[0.179,0.344]	
Learning Disorder	0.197	0.376	0.018	0.232	0.293	0.208
	[0.1,0.294]	[0.261,0.494]		[0.153,0.311]	[0.212,0.383]	
School grade 6	0.318	0.318	1	0.335	0.342	0.85
	[0.205,0.432]	[0.205,0.432]		[0.251,0.427]	[0.254,0.431]	
School grade 7	0.394	0.288	0.107	0.357	0.356	0.93
	[0.275,0.513]	[0.178,0.398]		[0.268,0.446]	[0.271,0.45]	
Std INVALSI Math 5	0.122	0.07	0.629	-0.15	-0.072	0.366
	[-0.111,0.351]	[-0.14,0.287]		[-0.257,-0.027]	[-0.17,0.042]	
SES Status	-0.178	-0.163	0.885	-0.285	-0.537	0.002
	[-0.404,0.05]	[-0.346,0.027]		[-0.381,-0.17]	[-0.658,-0.416]	
Baseline math grade	6.303	6.228	0.627	6.418	6.577	0.309
	[6.056,6.558]	[5.985,6.479]		[6.214,6.62]	[6.366,6.8]	
Single parent household	0.076	0.394	0	0.241	0.212	0.468
	[0.012,0.14]	[0.275,0.513]		[0.161,0.321]	[0.139,0.293]	
Mother Education: High-school	0.386	0.554	0.031	0.448	0.405	0.511
	[0.275,0.513]	[0.44,0.672]		[0.357,0.54]	[0.314,0.497]	
Mother Education: University	0.155	0.13	0.574	0.136	0.153	0.796
	[0.072,0.245]	[0.053,0.211]		[0.073,0.2]	[0.087,0.22]	
Father Education: High-school	0.496	0.299	0.015	0.483	0.342	0.022
	[0.378,0.62]	[0.191,0.409]		[0.396,0.575]	[0.254,0.431]	
Father Education: University	0.13	0.03	0.033	0.08	0.087	0.938
	[0.053,0.22]	[-0.004,0.072]		[0.03,0.131]	[0.037,0.144]	
Mother Occupation: White-collar	0.437	0.46	0.706	0.423	0.416	0.639
	[0.344,0.529]	[0.358,0.564]		[0.355,0.493]	[0.336,0.496]	
Mother Occupation: Blue-collar	0.542	0.482	0.295	0.494	0.543	0.284
	[0.438,0.632]	[0.374,0.589]		[0.426,0.567]	[0.468,0.621]	
Father Occupation: White-collar	0.474	0.2	0	0.265	0.413	0.001
	[0.359,0.591]	[0.137,0.266]		[0.191,0.34]	[0.328,0.499]	
Father Occupation: Blue-collar	0.505	0.736	0.001	0.675	0.534	0.003
	[0.39,0.622]	[0.658,0.814]		[0.602,0.762]	[0.448,0.621]	

Notes: The table reports the median CLAN estimates for all covariates over 100 splits. The numbers in columns 1 and 4 (2 and 5) represent the share of individuals with a given characteristic among those belonging to the top (bottom) quartile in terms of impact of the treatment. 90 percent confidence intervals are reported in square brackets. Columns 3 and 6 report the p-value for the hypothesis that the difference between columns (1) and (2) -or between (4) and (5), respectively- is zero.

Table C.VI. CLAN of Socio-Emotional Index

	(1)	(2)	(3)	(4)	(5)	(6)
		TOP 2020			**TOP 2022**	
Variable	Upper quartile	Lower quartile	p-value difference	Upper quartile	Lower quartile	p-value difference
Female	0.489	0.359	0.111	0.474	0.42	0.54
	[0.384,0.597]	[0.252,0.469]		[0.385,0.57]	[0.328,0.512]	
Immigrant	0.153	0.125	0.374	0.292	0.237	0.314
	[0.077,0.231]	[0.052,0.198]		[0.208,0.376]	[0.161,0.321]	
Learning Disorder	0.233	0.388	0.03	0.221	0.277	0.291
	[0.144,0.327]	[0.276,0.499]		[0.144,0.298]	[0.194,0.36]	
School grade 6	0.25	0.366	0.117	0.328	0.29	0.621
	[0.157,0.343]	[0.258,0.478]		[0.24,0.414]	[0.21,0.38]	
School grade 7	0.413	0.305	0.142	0.266	0.518	0
	[0.308,0.522]	[0.202,0.411]		[0.184,0.347]	[0.425,0.611]	
Std INVALSI Math 5	-0.135	0.33	0.001	-0.144	-0.109	0.756
	[-0.325,0.054]	[0.105,0.551]		[-0.262,-0.009]	[-0.202,-0.02]	
SES Status	-0.424	0.001	0.001	-0.505	-0.327	0.024
	[-0.606,-0.239]	[-0.182,0.2]		[-0.608,-0.398]	[-0.426,-0.215]	
Baseline math grade	5.881	6.624	0	6.293	6.562	0.097
	[5.708,6.058]	[6.374,6.884]		[6.1,6.515]	[6.364,6.76]	
Single parent household	0.223	0.201	0.842	0.159	0.295	0.017
	[0.135,0.313]	[0.112,0.292]		[0.092,0.227]	[0.21,0.38]	
Mother Education: High-school	0.415	0.541	0.102	0.427	0.393	0.59
	[0.31,0.52]	[0.434,0.652]		[0.337,0.52]	[0.302,0.484]	
Mother Education: University	0.115	0.175	0.296	0.109	0.127	0.437
	[0.051,0.184]	[0.091,0.26]		[0.052,0.167]	[0.067,0.19]	
Father Education: High-school	0.359	0.41	0.56	0.548	0.225	0
	[0.258,0.467]	[0.303,0.518]		[0.457,0.638]	[0.151,0.301]	
Father Education: University	0.072	0.1	0.499	0.091	0.045	0.072
	[0.017,0.125]	[0.034,0.166]		[0.039,0.144]	[0.006,0.083]	
Mother Occupation: White-collar	0.396	0.462	0.238	0.52	0.289	0
	[0.312,0.482]	[0.373,0.563]		[0.449,0.599]	[0.222,0.359]	
Mother Occupation: Blue-collar	0.572	0.494	0.325	0.423	0.669	0
	[0.484,0.659]	[0.401,0.592]		[0.349,0.495]	[0.6,0.748]	
Father Occupation: White-collar	0.333	0.326	0.806	0.282	0.325	0.345
	[0.239,0.429]	[0.226,0.425]		[0.205,0.359]	[0.248,0.406]	
Father Occupation: Blue-collar	0.638	0.646	0.83	0.67	0.633	0.285
	[0.542,0.735]	[0.543,0.748]		[0.592,0.751]	[0.554,0.713]	

Notes: The table reports the median CLAN estimates for all covariates over 100 splits. The numbers in columns 1 and 4 (2 and 5) represent the share of individuals with a given characteristic among those belonging to the top (bottom) quartile in terms of impact of the treatment. 90 percent confidence intervals are reported in square brackets. Columns 3 and 6 report the p-value for the hypothesis that the difference between columns (1) and (2) -or between (4) and (5), respectively- is zero.

Table C.VII. CLAN of Well-being Index

	(1)	(2)	(3)	(4)	(5)	(6)
		TOP 2020			**TOP 2022**	
Variable	Upper quartile	Lower quartile	p-value difference	Upper quartile	Lower quartile	p-value difference
Female	0.52	0.286	0.005	0.407	0.595	0.003
	[0.407,0.632]	[0.184,0.388]		[0.319,0.497]	[0.501,0.691]	
Immigrant	0.318	0.015	0	0.264	0.28	0.815
	[0.219,0.43]	[-0.008,0.041]		[0.185,0.345]	[0.192,0.369]	
Learning Disorder	0.392	0.255	0.128	0.266	0.269	0.82
	[0.285,0.503]	[0.161,0.356]		[0.188,0.351]	[0.183,0.355]	
School grade 6	0.273	0.344	0.316	0.419	0.262	0.008
	[0.173,0.373]	[0.243,0.458]		[0.329,0.512]	[0.176,0.351]	
School grade 7	0.325	0.402	0.244	0.267	0.413	0.023
	[0.219,0.43]	[0.292,0.513]		[0.186,0.35]	[0.315,0.509]	
Std INVALSI Math 5	-0.088	0.355	0.004	-0.085	-0.122	0.405
	[-0.273,0.091]	[0.127,0.578]		[-0.196,0.037]	[-0.239,0.007]	
SES Status	-0.639	0.368	0	-0.47	-0.343	0.123
	[-0.795,-0.465]	[0.199,0.547]		[-0.597,-0.323]	[-0.453,-0.238]	
Baseline math grade	5.89	6.643	0	6.795	6.08	0
	[5.692,6.086]	[6.392,6.895]		[6.577,6.998]	[5.881,6.28]	
Single parent household	0.351	0.094	0	0.195	0.261	0.132
	[0.244,0.458]	[0.029,0.159]		[0.124,0.268]	[0.175,0.348]	
Mother Education: High-school	0.364	0.569	0.004	0.439	0.422	0.795
	[0.256,0.472]	[0.461,0.677]		[0.356,0.528]	[0.329,0.524]	
Mother Education: University	0.078	0.29	0	0.165	0.111	0.193
	[0.018,0.138]	[0.191,0.393]		[0.101,0.232]	[0.052,0.171]	
Father Education: High-school	0.338	0.434	0.171	0.378	0.415	0.458
	[0.231,0.444]	[0.326,0.543]		[0.292,0.467]	[0.323,0.509]	
Father Education: University	0.026	0.172	0.001	0.15	0.038	0.012
	[-0.001,0.062]	[0.089,0.257]		[0.088,0.213]	[0.002,0.073]	
Mother Occupation: White-collar	0.205	0.845	0	0.444	0.377	0.129
	[0.152,0.261]	[0.773,0.919]		[0.373,0.518]	[0.308,0.443]	
Mother Occupation: Blue-collar	0.762	0.093	0	0.505	0.567	0.252
	[0.69,0.824]	[0.035,0.153]		[0.433,0.578]	[0.493,0.638]	
Father Occupation: White-collar	0.238	0.491	0	0.368	0.309	0.308
	[0.17,0.311]	[0.381,0.606]		[0.29,0.448]	[0.226,0.392]	
Father Occupation: Blue-collar	0.75	0.447	0	0.58	0.644	0.266
	[0.675,0.822]	[0.339,0.558]		[0.5,0.663]	[0.563,0.728]	

Notes: The table reports the median CLAN estimates for all covariates over 100 splits. The numbers in columns 1 and 4 (2 and 5) represent the share of individuals with a given characteristic among those belonging to the top (bottom) quartile in terms of impact of the treatment. 90 percent confidence intervals are reported in square brackets. Columns 3 and 6 report the p-value for the hypothesis that the difference between columns (1) and (2) -or between (4) and (5), respectively- is zero.

D Additional results

D1 Robustness

In Tables D.I and D.II we conduct a robustness analysis of our main results for TOP 2020 and 2022. Columns 1 and 2 display, respectively, OLS estimates and standard errors from our benchmark specification, for comparison purposes.

In columns 3 and 4, we choose the set of control variables in a systematic way with double post LASSO procedure, following Belloni et al. (2012). We include all baseline characteristics that are sufficiently correlated with treatment –after imposing the LASSO penalty– and the variables that are sufficiently correlated with control –again, after imposing the LASSO penalty (Ludwig, Mullainathan and Spiess, 2017).[4] A comparison of columns 1 and 3 shows that including LASSO-selected controls makes no substantial difference in most results, with the exception of the Aspiration index for TOP 2020 (Table D.I), where the estimated effect is still positive, but smaller in magnitude and not significant at conventional levels.

Finally, in the last two columns we present inverse probability-weighted estimates, which help address potential bias related to attrition in our survey outcomes.[5] The estimated effects are almost unchanged and, if anything, slightly larger due to the minor imbalances in our survey data (with the control group being positively selected in terms of parental background). Overall, the different robustness checks presented provide a consistent picture of the positive impact of TOP on student outcomes.

[4]The double post LASSO procedure is based on three steps. First, we fit a LASSO regression predicting the dependent variable and we select all variables with a non-zero coefficient after the introduction of a penalty term that shrinks the estimated regression coefficients towards zero to reduce over-fitting. Second, we fit a LASSO regression predicting the treatment variable and following the same procedure of step one. Finally, we fit a linear regression of the outcome variable on the treatment variable including the covariates selected in either the first or the second step. Table D.III lists the controls selected using LASSO for each outcome.

[5]Since there is no attrition in the administrative data, the first two lines in each table (i.e., grade and failure rate obtained from administrative records) do not report any estimates.

Table D.I. Robustness checks: TOP 2020

	(1)	(2)	(3)	(4)	(5)	(6)
	Standard controls		LASSO controls		Inverse Probability Weighting	
	Coeff	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error
Academic Outcomes						
Performance Index	0.303	0.071	0.278	0.072	0.325	0.072
Grade Math Endline	0.113	0.056	0.121	0.054	NA	NA
Fail Math Endline	-0.044	0.022	-0.039	0.022	NA	NA
Std Performance Math	0.234	0.075	0.201	0.075	0.269	0.076
Non academic outcomes						
Aspirations						
Std Aspirations Index	0.167	0.078	0.094	0.065	0.134	0.077
Aspirations University (student)	0.062	0.037	0.035	0.034	0.050	0.037
Self-efficacy University (student)	0.040	0.032	0.027	0.031	0.033	0.032
High-school: vocational	-0.058	0.034	-0.019	0.029	-0.056	0.034
High-school: top tier	-0.000	0.027	-0.000	0.022	0.002	0.026
Aspirations University (parent)	0.042	0.033	0.016	0.031	0.043	0.034
Self-efficacy: university (parent)	0.080	0.032	0.072	0.030	0.079	0.032
Aspirations University (tutor)	0.029	0.022	0.031	0.021	0.029	0.021
Socio-Emotional Skills						
Std Socio-emotional Index	0.146	0.075	0.135	0.070	0.164	0.076
Logic task: difficult	0.048	0.037	0.044	0.037	0.046	0.038
Logic task: give-up	-0.034	0.026	-0.034	0.026	-0.041	0.027
Grit (student)	0.015	0.010	0.011	0.009	0.016	0.010
Grit (parent)	-0.006	0.010	-0.007	0.009	-0.004	0.010
Locus of control	0.023	0.009	0.024	0.009	0.025	0.009
Well-being						
Std Well-being Index	0.162	0.082	0.150	0.077	0.199	0.083
Depression (student)	-0.018	0.009	-0.022	0.009	-0.021	0.009
Happiness (student)	0.025	0.017	0.023	0.017	0.030	0.018
Depression (parent)	-0.011	0.008	-0.010	0.008	-0.014	0.008
Happiness (parent)	0.035	0.016	0.034	0.016	0.033	0.016

Notes: OLS estimates and standard errors in columns (1) and (2), coefficients and standard errors for the regressions with LASSO selected controls in columns (3) and (4) and coefficients and standard errors corrected through inverse probability weighting (IPW) in column (4) and (5). Randomization round fixed effects included in all regressions. The controls included for each regression and selected with LASSO are listed in Table D.III. The results with inverse probability weighting include all standard controls: parental education and occupation, gender, immigration status, learning disorders, school grade, teacher-assigned grades, SES status, and test scores in math at baseline. Since there is no attrition in the administrative data, IPW estimates are not calculated for teacher-assigned grades and failure rate.

Table D.II. Robustness checks: TOP 2022

	(1)	(2)	(3)	(4)	(5)	(6)
	Standard controls		LASSO controls		Inverse Probability Weighting	
	Coeff	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error
Academic Outcomes						
Performance Index	0.163	0.058	0.170	0.056	0.164	0.058
Grade Math Endline	0.088	0.055	0.075	0.055	NA	NA
Fail Math Endline	-0.066	0.027	-0.059	0.026	NA	NA
Std Performance Math	0.155	0.059	0.160	0.059	0.155	0.060
Non academic outcomes						
Aspirations						
Std Aspirations Index	0.058	0.066	0.043	0.056	0.059	0.066
Aspirations University (student)	0.022	0.030	0.020	0.029	0.018	0.030
Self-efficacy University (student)	0.000	0.029	0.001	0.028	0.000	0.029
High-school: vocational	-0.031	0.027	-0.017	0.023	-0.032	0.028
High-school: top tier	0.038	0.023	0.025	0.020	0.039	0.023
Aspirations University (parent)	0.031	0.028	0.023	0.026	0.032	0.028
Self-efficacy: university (parent)	-0.002	0.030	0.003	0.030	0.000	0.030
Aspirations University (tutor)	-0.007	0.014	-0.005	0.014	-0.009	0.015
Socio-Emotional Skills						
Std Socio-emotional Index	-0.039	0.071	-0.032	0.067	-0.048	0.070
Logic task: difficult	-0.011	0.034	-0.009	0.033	-0.012	0.034
Logic task: give-up	0.007	0.023	0.005	0.023	0.009	0.023
Grit (student)	-0.009	0.009	-0.007	0.008	-0.009	0.009
Grit (parent)	-0.008	0.008	-0.005	0.008	-0.009	0.008
Locus of control	0.007	0.008	0.006	0.007	0.007	0.008
Well-being						
Std Well-being Index	0.037	0.072	0.027	0.067	0.029	0.073
Depression (student)	-0.006	0.008	-0.004	0.007	-0.006	0.008
Happiness (student)	0.008	0.014	0.005	0.013	0.007	0.014
Depression (parent)	-0.003	0.007	-0.004	0.006	-0.003	0.007
Happiness (parent)	0.001	0.012	0.001	0.012	0.002	0.012

Notes: This table shows the main OLS estimates and the standard errors in columns (1) and (2), the coefficients and standard errors for the regressions with LASSO selected controls in columns (3) and (4) and the coefficients and standard errors corrected through inverse probability weighting (IPW) in column (4) and (5). Randomization round fixed effects included in all regressions. The controls included for each regression and selected with LASSO are listed in Table D.IV. The results with inverse probability weighting include all standard controls: parental education and occupation, gender, immigration status, learning disorders, school grade, teacher-assigned grades, SES status, and test scores in math at baseline. Since there is no attrition in the administrative data, IPW estimates are not calculated for teacher-assigned grades and failure rate.

Table D.III. LASSO selected variables, TOP 2020

(a). Academic Outcomes

	(1)	(2)	(3)
	Grade	Fail	Performance
Baseline math grade	✓	✓	✓
Std INVALSI Math 5	✓		✓
SES Status	✓		
Single parent household	✓		
Math Grade at baseline (Missing)	✓		
Learning disorders			✓
School grade 6			✓
School grade 7			✓

(b). Aspirations Index

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Aspirations Index	Students				Parents		Teachers
		Aspirations	Self-efficacy	High school vocational	High school top track	Aspirations	Self-efficacy	Aspirations
Female	✓	✓				✓		
Immigrant	✓	✓				✓		
Learning disorders	✓			✓		✓	✓	✓
Baseline math grade	✓	✓	✓	✓	✓	✓	✓	✓
Std INVALSI Math 5	✓	✓			✓	✓	✓	
Mother Education: University	✓	✓	✓			✓	✓	✓
Father Education: University	✓	✓			✓	✓	✓	
SES Status			✓					
School grade 6				✓				

(c). Socio-emotional Skills

	(1)	(2)	(3)	(4)	(5)	(6)
	Socio-Emotional Index	Students				Parents Grit
		Perservance: difficulty	Perseverance: give up	Grit	Locus of control	
Learning disorders	✓	✓		✓		✓
Baseline math grade	✓				✓	✓
Mother Education: University						
Std INVALSI Math 5		✓				
Female						✓
Mother Occupation: White-collar						✓
Father Education: University						

(d). Well-being

	(1)	(2)	(3)	(4)	(5)
	Well-being Index	Students		Parents	
		Depression	Happiness	Depression	Happiness
Female		✓	✓		
Baseline math grade				✓	

Notes: This table shows the controls selected using LASSO for each outcome variable in TOP 2020.

Table D.IV. LASSO selected variables, TOP 2022

(a). Academic Outcomes

	(1)	(2)	(3)
	Grade	Fail	Performance
Baseline math grade	✓	✓	✓
Std INVALSI Math 5	✓		✓
SES Status	✓		
Single parent household	✓		
Math Grade at baseline (Missing)	✓		
Mother Education: University			
Learning disorders			✓
School grade 6			✓
School grade 7			✓

(b). Aspirations Index

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Aspirations Index	Students				Parents		Teachers
		Aspirations	Self-efficacy	High school vocational	High school top track	Aspirations	Self-efficacy	Aspirations
Female	✓	✓				✓		
Immigrant	✓	✓				✓		
Learning disorders	✓			✓		✓	✓	✓
Baseline math grade	✓	✓	✓	✓	✓	✓	✓	✓
Std INVALSI Math 5	✓	✓			✓	✓	✓	
Mother Education: University	✓	✓	✓			✓	✓	✓
Father Education: University	✓	✓			✓	✓	✓	
SES Status			✓					
School grade 6				✓				

(c). Socio-emotional Skills

	(1)	(2)	(3)	(4)	(5)	(6)
	Socio-Emotional Index	Students				Parents
		Perservance: difficulty	Perseverance: give up	Grit	Locus of control	Grit
Learning disorders	✓	✓		✓		✓
Baseline math grade	✓				✓	✓
Mother Education: University						
Std INVALSI Math 5		✓				
Female						✓
Mother Occupation: White-collar						✓
Father Education: University						

(d). Well-being

	(1)	(2)	(3)	(4)	(5)
	Well-being Index	Students		Parents	
		Depression	Happiness	Depression	Happiness
Female		✓	✓		
Baseline math grade				✓	

Notes: This table shows the controls selected using LASSO for each outcome variable in TOP 2022.

D2 Medium-term outcomes

Table D.V reports limited evidence on the medium-term impact of the intervention. The limitation stems from the fact that the only administrative data we have available for years other than the school year of the intervention is for students who participated in TOP 2020 while they were in grades 7 or 8. For these students we can investigate the effect of receiving tutoring on standardized test scores *the following year*, as well as on the type of high school track chosen at the end of middle school.

The national agency INVALSI administers a standardized test to all students in Italian schools at the end of grade 8. In column 1 of Table D.V we study how students who participated in TOP 2020 when they were in grade 7 performed in the INVALSI test in 2021, when they were in grade 8. The average effect of participating in the online tutoring is a 0.068 SD increase in test scores. The effect is not statistically significant due to the limited sample for which we observe this outcome, but the qualitative result is encouraging, especially considering that this test is taken one full year after the end of the intervention. Note that the effect is entirely driven by students who participated in the intense 6-hour tutoring: for this group the impact is +0.24 SD (p-value = 0.08).

Column 2 shows the impact of the program on the probability of attending a vocational track – the least academically demanding type of high school in the Italian system. This outcome is available for students who participated in TOP 2020 during grade 7 as well as grade 8 and is measured in 2022 for the former and in 2021 for the latter. Again, the estimates are not statistically significant, but they suggest a reduction in the probability of attending a vocational track by 3.7 percentage points (a 8% relative to the control group) consistent with Falk, Kosse and Pinger (2024).

Finally, in column 3 we consider as outcome the probability that, during grade 8, teachers recommend the student for a vocational high school track. Teacher recommendations are a feature of the Italian system and, albeit non-binding, are a useful indicator of teachers' assessment of the future potential of the students.[6] Teacher recommendations are available for *all* students who participated in TOP 2020 and for this outcome the average effect of the program is a precisely estimated zero.

[6]Carlana (2019) and Carlana, La Ferrara and Pinotti (2022*b*) show that teachers' recommendations also reflect implicit bias against female and immigrant students, respectively.

Table D.V. Estimation of the impact of TOP 2022 on medium-term academic outcomes

	(1)	(2)	(3)
	Test Score	Vocational track choice	Vocational track recommendation
Panel A: Overall results			
Treatment	0.068	-0.037	-0.009
	(0.088)	(0.036)	(0.028)
	[1.000]	[1.000]	[1.000]
R^2	0.413	0.153	0.210
Panel B: Results of 3 vs. 6 hours of tutoring			
Treatment	0.009	-0.042	0.005
	(0.098)	(0.039)	(0.030
Intense Treatment	0.226	0.026	-0.044
	(0.146)	(0.059)	(0.047)
Treat+Intense Treatment==0	0.080	0.775	0.384
R^2	0.417	0.156	0.223
Mean Dep:	0.00	0.46	0.62
Sample: TOP2020 in	Grade7	Grade7 and 8	Grade6, 7 and 8
Outcome observed in	2021	2021-2022	2020-2021-2022
Obs	341	721	1010

Notes: OLS estimates, robust standard errors in parentheses, and Anderson sharpened q-values in square brackets. The dependent variable is the INVALSI8 standardized test score of 2021 for students treated in grade 7 in column 1, a dummy variable for whether the student chooses vocational track in column 2, and a dummy variable for whether the student was recommended by teachers to vocational track in column 3. The test score is only available for one of the three treated cohorts while the track choice only for two of the treated cohorts. "Treatment" is an indicator for being assigned a tutor; "Intense treatment" is an indicator for being assigned to 6 hours of tutoring. In Panel B, we control for whether the students was identified for intense tutoring (coefficient not shown). Controls included in all regressions: parental education and occupation, gender, immigration status, learning disorders, school grade, teacher-assigned grades, SES status, and test scores in math at baseline. "Mean Dep" is the mean of the dependent variable at endline for students in the control group.

D3 Devices and internet connection

The key feature of TOP is the virtual nature of the interaction between tutor and student. By definition, the program requires a minimum technological input, namely an internet connection and a device that enables the tutor and the student to have a video call. When we recruited middle school students, we told school principals that the beneficiaries should have access to a tablet or PC and to an internet connection for at least 3 hours per week. In our endline survey, we collected information on whether the student used a phone for the tutoring: 20 percent of the students in TOP 2020 and 28 percent in TOP 2022 mainly used a smartphone to connect.

In Table D.VI we test whether the impact of the program was different for students who connected using a smartphone, compared to those who used a PC or a tablet. We find that in TOP 2020 (Panel A) the impact was not statistically different, except for aspirations, where the effect on students who used a smartphone is zero. Column 1 shows that, compared to an increase in test score of 0.32 SD for the students who connected with better devices, the impact for students using a smartphone was 0.27 SD, significant

at the 1 percent level. However, the positive effect on performance in TOP 2022 (Panel B) is fully driven by students who connected using a PC or tablet, while students who used the phone for tutoring were the only ones showing an improvement in aspirations and socio-emotional skills.

While based on the results during the pandemic one could have concluded that online tutoring was a promising option for relatively low-income settings –provided students had access to smartphones–, the overall picture including TOP 2022 suggests a more nuanced interpretation as far as academic outcomes are concerned. In normal school times, it may be necessary to provide a better device to students in need, in order to improve the effectiveness of online tutoring programs.

Table D.VI. Heterogeneity by whether student used phone for tutoring

	(1)	(2)	(3)	(4)
	Performance	Aspirations	Socio-emotional	Wellbeing
Panel A: TOP 2020				
Treatment	0.313	0.175	0.125	0.160
	(0.076)	(0.083)	(0.079)	(0.085)
Phone tutoring	-0.044	-0.040	0.103	0.010
	(0.096)	(0.123)	(0.118)	(0.131)
p-value Treat+Phone	[0.007]	[0.272]	[0.059]	[0.210]
Obs.	711	523	636	614
R^2	0.306	0.335	0.180	0.077
Panel B: TOP 2022				
Treatment	0.194	0.032	-0.088	0.054
	(0.060)	(0.068)	(0.074)	(0.075)
Phone tutoring	-0.190	0.161	0.303	-0.107
	(0.094)	(0.113)	(0.113)	(0.139)
p-value Treat+Phone	[0.969]	[0.097]	[0.061]	[0.706]
Obs.	943	889	898	881
R^2	0.240	0.221	0.066	0.075

Notes: OLS estimates, robust standard errors in parentheses, and p-values in square brackets. The dependent variable is the performance index column 1, the aspiration index in column 2, the socio-emotional index in column 3, and the well-being index in column 4. "Treatment" is an indicator for being assigned a tutor; "Phone tutoring" is an indicator for doing the tutoring using the phone. 20 percent of students in TOP 2020 and 28 percent of students in TOP 2022 used mainly the phone during the tutoring. The p-value of the sum of the coefficients "Treatment" and "Phone tutoring" is presented at the end of each panel. Panel A presents the results of TOP 2020, while Panel B of TOP 2022. Controls included in all regressions: parental education and occupation, gender, immigration status, learning disorders, school grade, teacher-assigned grades, SES status, and test scores in math at baseline.

E Cost and effect size of tutoring interventions

E1 Data selection process

In the replication package for this study, we include a dataset with the list of all tutoring interventions considered in our analysis, the effect size on the learning outcome, the cost per beneficiary, as well as the location, the sample size, the age range of the children included in the intervention, and the duration of the program.

To determine which studies to include in the dataset, we adopted the following selection criteria. First, to ensure comparability across interventions, we focused on studies reporting learning as an outcome, using standardized test scores (e.g., math, language, overall scores) or comparable performance metrics (e.g., reading fluency scores, comprehension test scores). To maintain consistency in effect size measurement, we report effect sizes in standard deviations (SD). We excluded programs reporting only other educational outcomes, such as enrollment, dropout rate, or attendance. Whenever an intervention reported multiple effect sizes for the same outcome dimension (e.g., effects on math vs. language test scores), we calculated the average effect size.

Second, each study had to clearly report the cost of the intervention per-beneficiary for a given year or provide enough information for this metric to be calculated. If costs were available in currencies other than USD, we converted them using exchange rates from the study's publication date retrieved from https://www.google.com/finance/, to generate Figure 2 in the main text. The reported cost ranges were averaged to obtain a single estimate per intervention.

Finally, we restricted our sample to studies in which the target population was school-aged children in high-income countries and with a minimum sample size of 70 observations.

The selection of educational interventions followed a systematic approach grounded in a thorough review of the literature. The first step of our search was to consider meta-analyses and systematic reviews evaluating or reporting the cost-effectiveness of tutoring programs. We began by reviewing the meta-analyses by Nickow, Oreopoulos and Quan (2020), Fryer Jr (2017) and Angrist et al. (2020), which provided a foundational overview of education interventions and their estimated impacts. Subsequently, we expanded our search by including relevant studies cited in these meta-analyses and using these as a starting point to identify additional pertinent studies through their references and related literature.

We also searched academic databases containing peer-reviewed research articles and scholarly working papers (e.g., EBSCO, JSTOR, NBER, etc.) . We conducted a broad search on Google Scholar by inserting combinations of the following terms "education", "intervention", "cost", "cost-effectiveness", "tutoring", "program", "treatment", "tutor", "student". For the most relevant studies, we applied both backward and forward citation tracking. This involved reviewing the study's references to identify relevant past research and examining subsequent studies that cited it to ensure comprehensive coverage of the literature.

Another approach we used leveraged "Connected Papers" – a tool that maps related academic papers based on conceptual similarity rather than direct citations, creating a visualization of interconnectedness of research articles. This approach facilitated a broader

exploration of the relevant literature.

Overall, the above methodology resulted in the inclusion of 21 programs based in high-income countries that included a tutoring component in at least one of their treatment arms. In Section V. of the paper, we compare the costs and effect size of TOP to those of the other interventions.

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