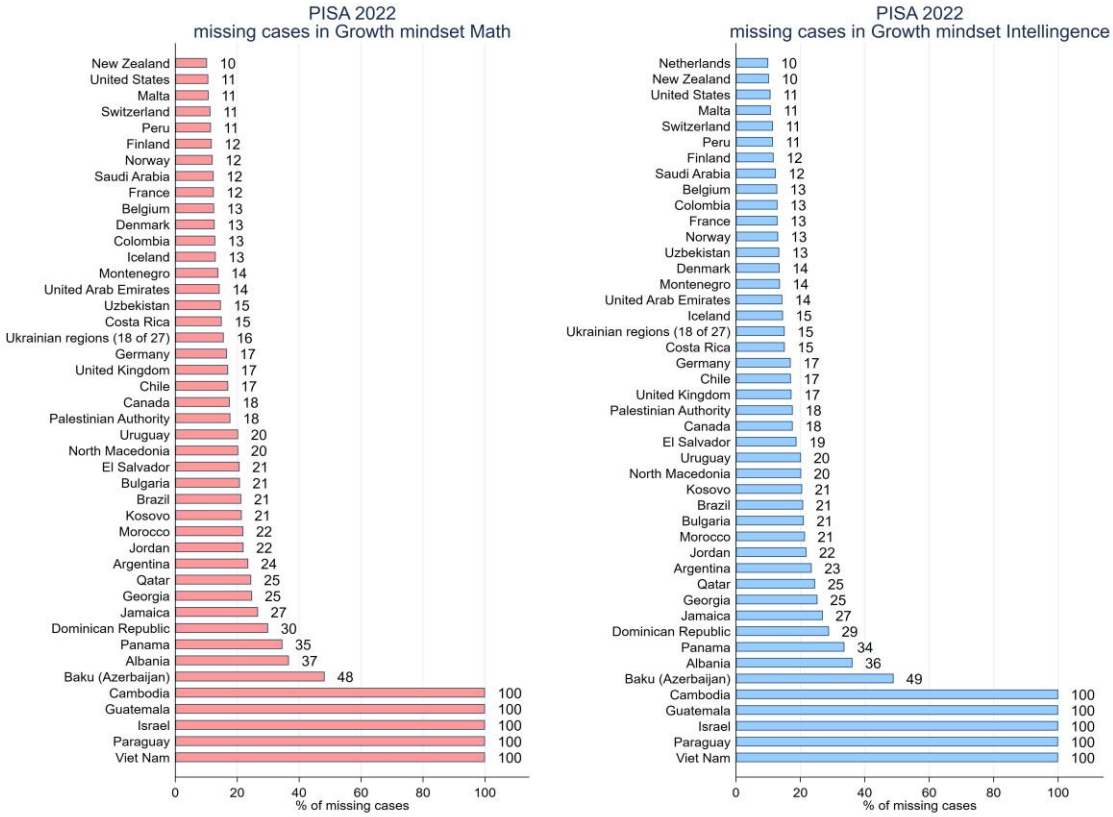
Supplementary Information

A. Further detail on data and sample description

Supplementary Figure 1: Countries with more than 10% of missingness in growth mindset variable

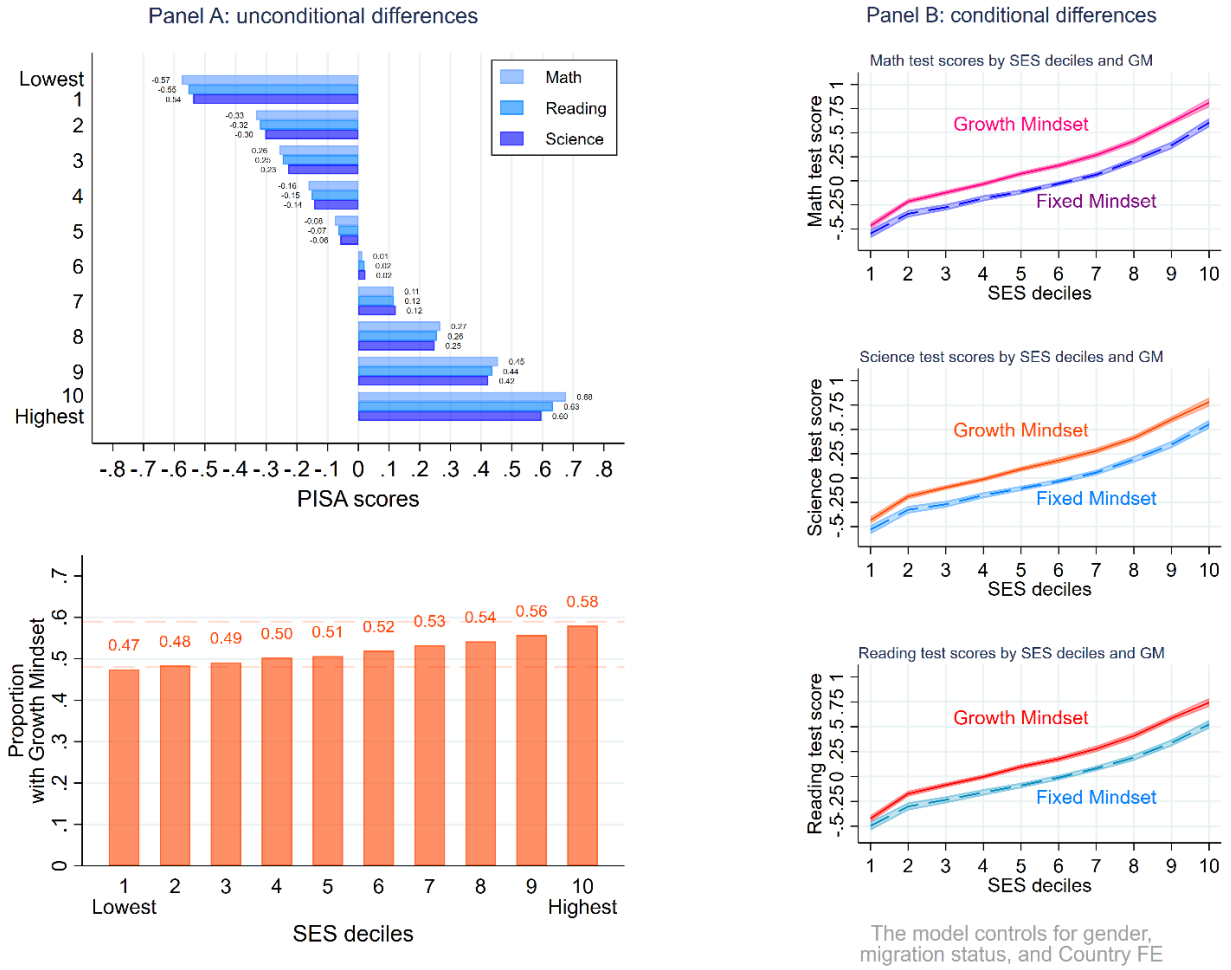
Supplementary Figure 1 shows the percentage of missing data for growth mindset variables in Math and Intelligence across various countries from PISA 2022.



B. Additional results

Supplementary 2: Descriptive stats for math, science and reading test scores compared

Supplementary Figure 2 shows descriptive statistics for PISA math, reading, and science test scores. Panel A displays unconditional differences, while Panel B presents conditional differences by SES deciles and Growth Mindset.



Supplementary Table 1: 4-Way decomposition results, 73 countries, science test scores, PISA 2022

Effects	Closing Gap	Fixing M = 0	Fixing M = 0.2	Fixing M = 0.4	Fixing M = 0.6
TE	-0.552***	-0.552***	-0.552***	-0.552***	-0.552***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
	[-0.557,-0.546]	[-0.557,-0.546]	[-0.557,-0.546]	[-0.557,-0.546]	[-0.557,-0.546]
CDE	-0.539***	-0.490***	-0.508***	-0.525***	-0.543***
	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)
	[-0.544,-0.534]	[-0.498,-0.483]	[-0.514,-0.502]	[-0.531,-0.520]	[-0.548,-0.537]
INT_ref	-0.000***	-0.049***	-0.031***	-0.014***	0.004***
	(0.000)	(0.003)	(0.002)	(0.001)	(0.000)
	[-0.001,-0.000]	[-0.055,-0.043]	[-0.035,-0.028]	[-0.016,-0.012]	[0.003,0.004]
INT_med	0.005***	0.005***	0.005***	0.005***	0.005***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	[0.005,0.006]	[0.005,0.006]	[0.005,0.006]	[0.005,0.006]	[0.005,0.006]
PIE	-0.018***	-0.018***	-0.018***	-0.018***	-0.018***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	[-0.019,-0.017]	[-0.019,-0.017]	[-0.019,-0.017]	[-0.019,-0.017]	[-0.019,-0.017]
Prop. CDE	0.977***	0.889***	0.921***	0.952***	0.984***
	(0.001)	(0.005)	(0.003)	(0.001)	(0.001)
	[0.975,0.978]	[0.879,0.899]	[0.914,0.927]	[0.950,0.955]	[0.982,0.986]
Prop. INT_ref	0.001***	0.088***	0.057***	0.025***	-0.006***
	(0.000)	(0.005)	(0.003)	(0.002)	(0.000)
	[0.000,0.001]	[0.078,0.099]	[0.050,0.064]	[0.022,0.028]	[-0.007,-0.006]
Prop. INT_med	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
	[-0.011,-0.009]	[-0.011,-0.009]	[-0.011,-0.009]	[-0.011,-0.009]	[-0.011,-0.009]
Prop. PIE	0.032***	0.032***	0.032***	0.032***	0.032***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
	[0.031,0.034]	[0.031,0.034]	[0.031,0.034]	[0.031,0.034]	[0.031,0.034]
OP med	0.022***	0.022***	0.022***	0.022***	0.022***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
	[0.021,0.024]	[0.021,0.024]	[0.021,0.024]	[0.021,0.024]	[0.021,0.024]
OP ati	-0.009***	0.078***	0.047***	0.015***	-0.016***
	(0.001)	(0.005)	(0.003)	(0.001)	(0.001)
	[-0.010,-0.008]	[0.069,0.088]	[0.041,0.052]	[0.013,0.017]	[-0.018,-0.014]
OP eliminated	0.023***	0.111***	0.079***	0.048***	0.016***
	(0.001)	(0.005)	(0.003)	(0.001)	(0.001)
	[0.022,0.025]	[0.101,0.121]	[0.073,0.086]	[0.045,0.050]	[0.014,0.018]
Observations	**503,656**	**503,656**	**503,656**	**503,656**	**503,656**

Note: Standard errors in parenthesis; 95% Confidence intervals in brackets; * p<0.10, ** p<0.05, *** p<0.01. TE=total effect; CDE=controlled direct effect; INT_ref=reference interaction; INT_med=mediated interaction; PIE=pure indirect effect; Prop. CDE=proportion controlled direct effect; Prop. INT_ref=proportion reference interaction; Prop. INT_med=proportion mediated interaction; prop. PIE=proportion pure indirect effect; OP med=overall proportion mediated; OP ati=overall proportion attributable to interaction; OP eliminated=overall proportion eliminated.

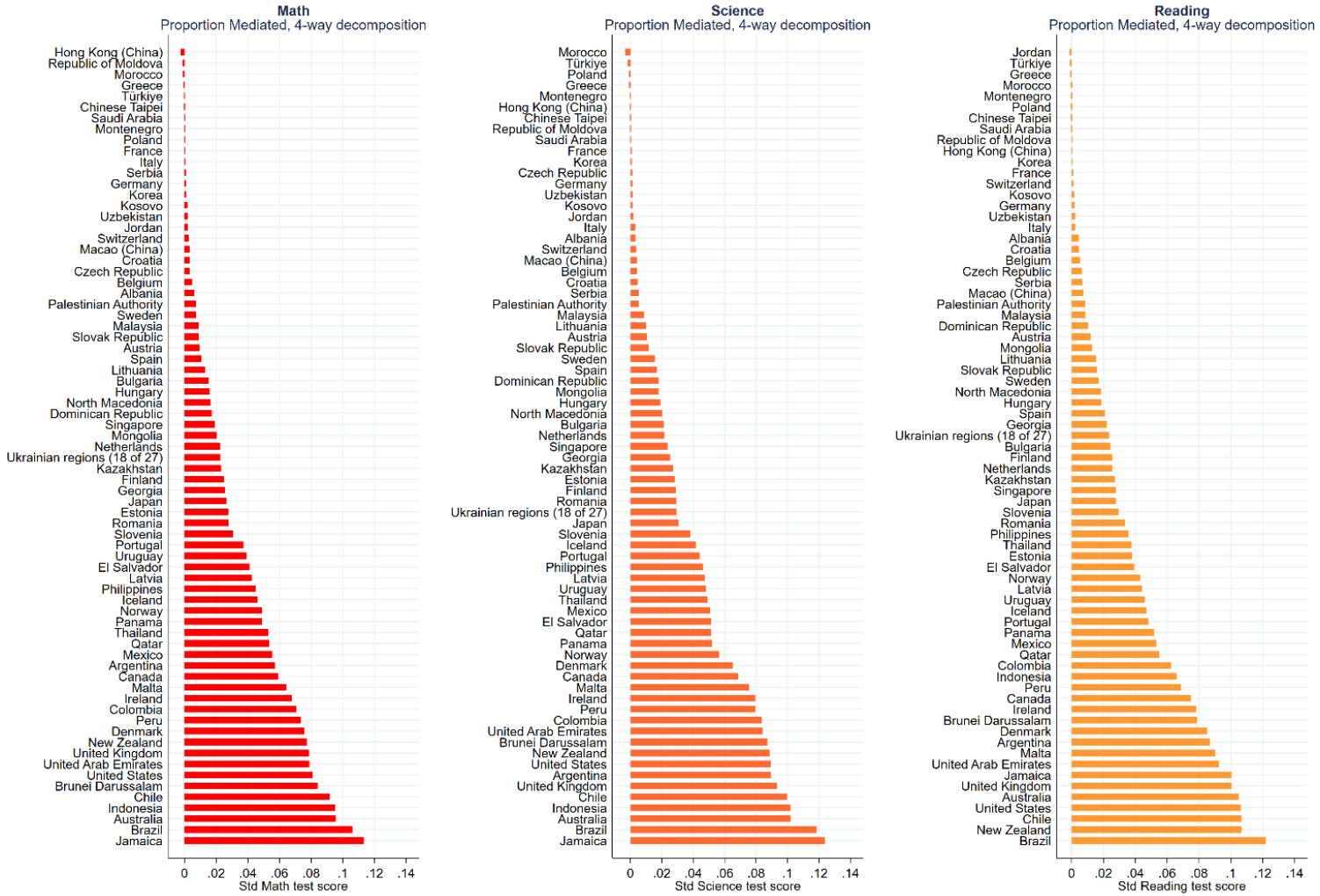
Supplementary Table 2: 4-Way decomposition results, 73 countries, reading test scores, PISA 2022

Effects	Closing Gap	Fixing M = 0	Fixing M = 0.2	Fixing M = 0.4	Fixing M = 0.6
TE	-0.525***	-0.525***	-0.525***	-0.525***	-0.525***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
	[-0.530,-0.519]	[-0.530,-0.519]	[-0.530,-0.519]	[-0.530,-0.519]	[-0.530,-0.519]
CDE	-0.512***	-0.468***	-0.484***	-0.500***	-0.516***
	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)
	[-0.518,-0.507]	[-0.476,-0.461]	[-0.490,-0.478]	[-0.505,-0.495]	[-0.521,-0.511]
INT_ref	-0.000***	-0.044***	-0.028***	-0.013***	0.003***
	(0.000)	(0.003)	(0.002)	(0.001)	(0.000)
	[-0.000,-0.000]	[-0.050,-0.039]	[-0.032,-0.025]	[-0.014,-0.011]	[0.003,0.004]
INT_med	0.005***	0.005***	0.005***	0.005***	0.005***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	[0.004,0.006]	[0.004,0.006]	[0.004,0.006]	[0.004,0.006]	[0.004,0.006]
PIE	-0.017***	-0.017***	-0.017***	-0.017***	-0.017***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	[-0.018,-0.016]	[-0.018,-0.016]	[-0.018,-0.016]	[-0.018,-0.016]	[-0.018,-0.016]
Prop. CDE	0.977***	0.893***	0.923***	0.953***	0.984***
	(0.001)	(0.005)	(0.003)	(0.001)	(0.001)
	[0.975,0.978]	[0.882,0.903]	[0.917,0.930]	[0.951,0.956]	[0.982,0.986]
Prop. INT_ref	0.001***	0.085***	0.054***	0.024***	-0.006***
	(0.000)	(0.006)	(0.004)	(0.002)	(0.000)
	[0.000,0.001]	[0.073,0.096]	[0.047,0.061]	[0.021,0.027]	[-0.007,-0.005]
Prop. INT_med	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
	[-0.011,-0.008]	[-0.011,-0.008]	[-0.011,-0.008]	[-0.011,-0.008]	[-0.011,-0.008]
Prop. PIE	0.032***	0.032***	0.032***	0.032***	0.032***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
	[0.030,0.034]	[0.030,0.034]	[0.030,0.034]	[0.030,0.034]	[0.030,0.034]
OP med	0.023***	0.023***	0.023***	0.023***	0.023***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
	[0.021,0.024]	[0.021,0.024]	[0.021,0.024]	[0.021,0.024]	[0.021,0.024]
OP ati	-0.009***	0.075***	0.045***	0.015***	-0.016***
	(0.001)	(0.005)	(0.003)	(0.001)	(0.001)
	[-0.010,-0.008]	[0.065,0.085]	[0.039,0.051]	[0.013,0.017]	[-0.018,-0.014]
OP eliminated	0.023***	0.107***	0.077***	0.047***	0.016***
	(0.001)	(0.005)	(0.003)	(0.001)	(0.001)
	[0.022,0.025]	[0.097,0.118]	[0.070,0.083]	[0.044,0.049]	[0.014,0.018]
Observations	**503,656**	**503,656**	**503,656**	**503,656**	**503,656**

Note: Standard errors in parenthesis; 95% Confidence intervals in brackets; * p<0.10, ** p<0.05, *** p<0.01. TE=total effect; CDE=controlled direct effect; INT_ref=reference interaction; INT_med=mediated interaction; PIE=pure indirect effect; Prop. CDE=proportion controlled direct effect; Prop. INT_ref=proportion reference interaction; Prop. INT_med=proportion mediated interaction; prop. PIE=proportion pure indirect effect; OP med=overall proportion mediated; OP ati=overall proportion attributable to interaction; OP eliminated=overall proportion eliminated.

Supplementary Figure 3: Proportion mediated (PIE) in 4-Way decomposition by country and PISA Test Score

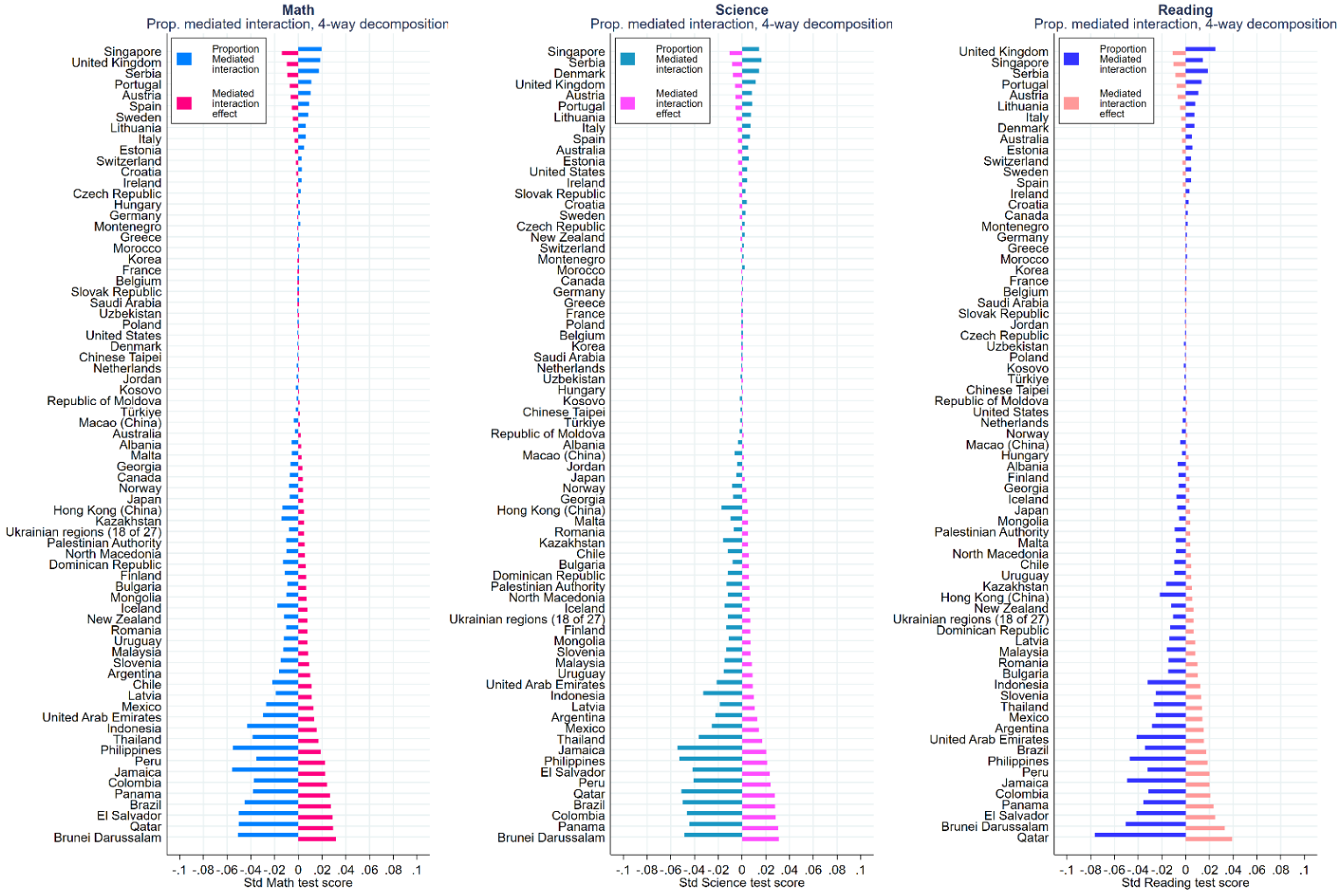
Supplementary Figure 3 shows the proportion mediated (PIE) in a 4-Way decomposition by country and PISA test score for Math, Science, and Reading.



Country ranking from lowest to highest test scores

Supplementary Figure 4: Proportion mediated interaction and mediated interaction effect (INT_med) in 4-Way decomposition by country and PISA Test Score

Supplementary Figure 4 shows the proportion mediated interaction and the mediated interaction effect (INT_med) from a 4-Way decomposition by country and PISA test score for Math, Science, and Reading.



Additional Results without including the control variables in the Main Four-Way Decomposition model

Supplementary Table 3: 4-Way decomposition results without control variables, 73 countries, Math test scores, PISA 2022

Effects	Closing Gap	Fixing M = 0	Fixing M = 0.2	Fixing M = 0.4	Fixing M = 0.6
TE	-0.580***	-0.580***	-0.580***	-0.580***	-0.580***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
	[-0.586,-0.574]	[-0.586,-0.574]	[-0.586,-0.574]	[-0.586,-0.574]	[-0.586,-0.574]
CDE	-0.572***	-0.528***	-0.544***	-0.560***	-0.576***
	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)
	[-0.578,-0.566]	[-0.537,-0.519]	[-0.551,-0.537]	[-0.566,-0.554]	[-0.582,-0.570]
INT_ref	0.000	-0.044***	-0.028***	-0.012***	0.004***
	(0.000)	(0.003)	(0.002)	(0.001)	(0.000)
	[-0.000,0.000]	[-0.051,-0.037]	[-0.032,-0.024]	[-0.014,-0.010]	[0.004,0.005]
INT_med	0.004***	0.004***	0.004***	0.004***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	[0.004,0.005]	[0.004,0.005]	[0.004,0.005]	[0.004,0.005]	[0.004,0.005]
PIE	-0.012***	-0.012***	-0.012***	-0.012***	-0.012***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	[-0.013,-0.012]	[-0.013,-0.012]	[-0.013,-0.012]	[-0.013,-0.012]	[-0.013,-0.012]
Prop. CDE	0.986***	0.910***	0.938***	0.966***	0.994***
	(0.001)	(0.006)	(0.004)	(0.001)	(0.001)
	[0.985,0.987]	[0.899,0.921]	[0.931,0.945]	[0.963,0.969]	[0.991,0.996]
Prop. INT_ref	-0.000	0.076***	0.048***	0.020***	-0.007***
	(0.000)	(0.006)	(0.004)	(0.002)	(0.001)
	[-0.000,0.000]	[0.064,0.087]	[0.041,0.055]	[0.017,0.023]	[-0.009,-0.006]
Prop. INT_med	-0.008***	-0.008***	-0.008***	-0.008***	-0.008***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
	[-0.009,-0.006]	[-0.009,-0.006]	[-0.009,-0.006]	[-0.009,-0.006]	[-0.009,-0.006]
Prop. PIE	0.021***	0.021***	0.021***	0.021***	0.021***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
	[0.020,0.023]	[0.020,0.023]	[0.020,0.023]	[0.020,0.023]	[0.020,0.023]
OP med	0.014***	0.014***	0.014***	0.014***	0.014***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
	[0.013,0.015]	[0.013,0.015]	[0.013,0.015]	[0.013,0.015]	[0.013,0.015]
OP ati	-0.008***	0.068***	0.041***	0.013***	-0.015***
	(0.001)	(0.005)	(0.003)	(0.001)	(0.001)
	[-0.009,-0.006]	[0.058,0.079]	[0.034,0.047]	[0.011,0.015]	[-0.017,-0.013]
OP eliminated	0.014***	0.090***	0.062***	0.034***	0.006***
	(0.001)	(0.006)	(0.004)	(0.001)	(0.001)
	[0.013,0.015]	[0.079,0.101]	[0.055,0.069]	[0.031,0.037]	[0.004,0.009]
Observations	**503,656**	**503,656**	**503,656**	**503,656**	**503,656**

Note: Standard errors in parenthesis; 95% Confidence intervals in brackets; * p<0.10, ** p<0.05, *** p<0.01. TE=total effect; CDE=controlled direct effect; INT_ref=reference interaction; INT_med=mediated interaction; PIE=pure indirect effect; Prop. CDE=proportion controlled direct effect; Prop. INT_ref=proportion reference interaction; Prop. INT_med=proportion mediated interaction; prop. PIE=proportion pure indirect effect; OP med=overall proportion mediated; OP ati=overall proportion attributable to interaction; OP eliminated=overall proportion eliminated.

Supplementary Table 4: 4-Way decomposition results without control variables, 73 countries, Science test scores, PISA 2022

Effects	Closing Gap	Fixing M = 0	Fixing M = 0.2	Fixing M = 0.4	Fixing M = 0.6
TE	-0.552***	-0.552***	-0.552***	-0.552***	-0.552***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
	[-0.559,-0.546]	[-0.559,-0.546]	[-0.559,-0.546]	[-0.559,-0.546]	[-0.559,-0.546]
CDE	-0.544***	-0.497***	-0.514***	-0.531***	-0.548***
	(0.003)	(0.005)	(0.004)	(0.003)	(0.003)
	[-0.550,-0.537]	[-0.506,-0.488]	[-0.521,-0.507]	[-0.538,-0.525]	[-0.555,-0.542]
INT_ref	0.000	-0.046***	-0.029***	-0.012***	0.005***
	(0.000)	(0.003)	(0.002)	(0.001)	(0.000)
	[-0.000,0.000]	[-0.053,-0.040]	[-0.034,-0.025]	[-0.014,-0.011]	[0.004,0.005]
INT_med	0.005***	0.005***	0.005***	0.005***	0.005***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	[0.004,0.005]	[0.004,0.005]	[0.004,0.005]	[0.004,0.005]	[0.004,0.005]
PIE	-0.013***	-0.013***	-0.013***	-0.013***	-0.013***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	[-0.014,-0.013]	[-0.014,-0.013]	[-0.014,-0.013]	[-0.014,-0.013]	[-0.014,-0.013]
Prop. CDE	0.984***	0.900***	0.931***	0.961***	0.992***
	(0.001)	(0.006)	(0.004)	(0.002)	(0.001)
	[0.983,0.986]	[0.888,0.912]	[0.923,0.938]	[0.958,0.965]	[0.990,0.995]
Prop. INT_ref	-0.000	0.084***	0.053***	0.023***	-0.008***
	(0.000)	(0.006)	(0.004)	(0.002)	(0.001)
	[-0.000,0.000]	[0.072,0.097]	[0.046,0.061]	[0.019,0.026]	[-0.010,-0.007]
Prop. INT_med	-0.008***	-0.008***	-0.008***	-0.008***	-0.008***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
	[-0.010,-0.007]	[-0.010,-0.007]	[-0.010,-0.007]	[-0.010,-0.007]	[-0.010,-0.007]
Prop. PIE	0.024***	0.024***	0.024***	0.024***	0.024***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
	[0.023,0.026]	[0.023,0.026]	[0.023,0.026]	[0.023,0.026]	[0.023,0.026]
OP med	0.016***	0.016***	0.016***	0.016***	0.016***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
	[0.015,0.017]	[0.015,0.017]	[0.015,0.017]	[0.015,0.017]	[0.015,0.017]
OP ati	-0.008***	0.076***	0.045***	0.014***	-0.017***
	(0.001)	(0.006)	(0.003)	(0.001)	(0.001)
	[-0.010,-0.007]	[0.065,0.087]	[0.038,0.052]	[0.012,0.016]	[-0.019,-0.014]
OP eliminated	0.016***	0.100***	0.069***	0.039***	0.008***
	(0.001)	(0.006)	(0.004)	(0.002)	(0.001)
	[0.014,0.017]	[0.088,0.112]	[0.062,0.077]	[0.035,0.042]	[0.005,0.010]
Observations	**503,656**	**503,656**	**503,656**	**503,656**	**503,656**

Note: Standard errors in parenthesis; 95% Confidence intervals in brackets; * p<0.10, ** p<0.05, *** p<0.01. TE=total effect; CDE=controlled direct effect; INT_ref=reference interaction; INT_med=mediated interaction; PIE=pure indirect effect; Prop. CDE=proportion controlled direct effect; Prop. INT_ref=proportion reference interaction; Prop. INT_med=proportion mediated interaction; prop. PIE=proportion pure indirect effect; OP med=overall proportion mediated; OP ati=overall proportion attributable to interaction; OP eliminated=overall proportion eliminated.

Supplementary Table 5: 4-Way decomposition results without control variables, 73 countries, Reading test scores, PISA 2022

Effects	Closing Gap	Fixing M = 0	Fixing M = 0.2	Fixing M = 0.4	Fixing M = 0.6
TE	-0.528***	-0.528***	-0.528***	-0.528***	-0.528***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
	[-0.534,-0.522]	[-0.534,-0.522]	[-0.534,-0.522]	[-0.534,-0.522]	[-0.534,-0.522]
CDE	-0.520***	-0.474***	-0.491***	-0.508***	-0.524***
	(0.003)	(0.005)	(0.004)	(0.003)	(0.003)
	[-0.526,-0.514]	[-0.483,-0.466]	[-0.498,-0.484]	[-0.514,-0.501]	[-0.531,-0.518]
INT_ref	0.000	-0.046***	-0.029***	-0.012***	0.004***
	(0.000)	(0.003)	(0.002)	(0.001)	(0.000)
	[-0.000,0.000]	[-0.052,-0.039]	[-0.033,-0.025]	[-0.014,-0.010]	[0.004,0.005]
INT_med	0.005***	0.005***	0.005***	0.005***	0.005***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	[0.004,0.005]	[0.004,0.005]	[0.004,0.005]	[0.004,0.005]	[0.004,0.005]
PIE	-0.013***	-0.013***	-0.013***	-0.013***	-0.013***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	[-0.013,-0.012]	[-0.013,-0.012]	[-0.013,-0.012]	[-0.013,-0.012]	[-0.013,-0.012]
Prop. CDE	0.985***	0.899***	0.930***	0.962***	0.993***
	(0.001)	(0.006)	(0.004)	(0.002)	(0.001)
	[0.983,0.986]	[0.886,0.911]	[0.923,0.938]	[0.959,0.965]	[0.991,0.996]
Prop. INT_ref	-0.000	0.086***	0.055***	0.023***	-0.008***
	(0.000)	(0.007)	(0.004)	(0.002)	(0.001)
	[-0.000,0.000]	[0.073,0.099]	[0.046,0.063]	[0.020,0.027]	[-0.010,-0.007]
Prop. INT_med	-0.009***	-0.009***	-0.009***	-0.009***	-0.009***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
	[-0.010,-0.007]	[-0.010,-0.007]	[-0.010,-0.007]	[-0.010,-0.007]	[-0.010,-0.007]
Prop. PIE	0.024***	0.024***	0.024***	0.024***	0.024***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
	[0.022,0.025]	[0.022,0.025]	[0.022,0.025]	[0.022,0.025]	[0.022,0.025]
OP med	0.015***	0.015***	0.015***	0.015***	0.015***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
	[0.014,0.016]	[0.014,0.016]	[0.014,0.016]	[0.014,0.016]	[0.014,0.016]
OP ati	-0.009***	0.078***	0.046***	0.014***	-0.017***
	(0.001)	(0.006)	(0.004)	(0.001)	(0.001)
	[-0.010,-0.007]	[0.066,0.089]	[0.039,0.053]	[0.012,0.017]	[-0.020,-0.014]
OP eliminated	0.015***	0.101***	0.070***	0.038***	0.007***
	(0.001)	(0.006)	(0.004)	(0.002)	(0.001)
	[0.014,0.017]	[0.089,0.114]	[0.062,0.077]	[0.035,0.041]	[0.004,0.009]
Observations	**503,656**	**503,656**	**503,656**	**503,656**	**503,656**

Note: Standard errors in parenthesis; 95% Confidence intervals in brackets; * p<0.10, ** p<0.05, *** p<0.01. TE=total effect; CDE=controlled direct effect; INT_ref=reference interaction; INT_med=mediated interaction; PIE=pure indirect effect; Prop. CDE=proportion controlled direct effect; Prop. INT_ref=proportion reference interaction; Prop. INT_med=proportion mediated interaction; prop. PIE=proportion pure indirect effect; OP med=overall proportion mediated; OP ati=overall proportion attributable to interaction; OP eliminated=overall proportion eliminated.

C. Estimation Details for Continuous Outcome & Binary Mediator

Defining Y as a continuous outcome, A as binary treatment and M as binary mediator, under assumptions (i)-(iv) and correct specification of the regression models for Y and M:

[1]

$$E[Y \mid a, m, c] = \theta_0 + \theta_1 a + \theta_2 m + \theta_3 am + \theta_4' c$$
$$\text{logit}\,\{P(M = 1 \mid a, c)\} = \beta_0 + \beta_1 a + \beta_2' c.$$

Valeri and VanderWeele (2013) show that the average controlled direct effect (CDE) and the average pure indirect effect (PIE) are given by:

[2]

$$E[CDE(m^*) \mid c] = (\theta_1 + \theta_3 m^*)(a - a^*)$$
$$E[PIE \mid c] = (\theta_2 + \theta_3 a^*)\left\{\frac{\exp[\beta_0 + \beta_1 a + \beta_2' c]}{1 + \exp[\beta_0 + \beta_1 a + \beta_2' c]} - \frac{\exp[\beta_0 + \beta_1 a^* + \beta_2' c]}{1 + \exp[\beta_0 + \beta_1 a^* + \beta_2' c]}\right\}$$

The reference interaction (INT_ref) is given by the difference between the pure direct effect and the controlled direct effect, which were both given by Valeri and VanderWeele:

[3]

$$E\left[INT_{ref}(m^*) \mid c\right] = \{\theta_1(a-a^*)\} + \{\theta_3(a-a^*)\}\frac{\exp[\beta_0+\beta_1 a^*+\beta_2' c]}{1+\exp\left[\beta_0+\beta_1 a^*+\beta_2' c\right]} - (\theta_1+\theta_3 m^*)(a-a^*)$$
$$= \theta_3(a-a^*)\left(\frac{\exp[\beta_0+\beta_1 a^*+\beta_2' c]}{1+\exp\left[\beta_0+\beta_1 a^*+\beta_2' c\right]} - m^*\right)$$

The mediated interaction (INT_med) is given by the difference between the total indirect effect and the pure indirect effect:

[4]

$$E[INT_{\text{med}} \mid c] = (\theta_2+\theta_3 a)\left\{\frac{\exp[\beta_0+\beta_1 a+\beta_2' c]}{1+\exp\left[\beta_0+\beta_1 a+\beta_2' c\right]} - \frac{\exp[\beta_0+\beta_1 a^*+\beta_2' c]}{1+\exp\left[\beta_0+\beta_1 a^*+\beta_2' c\right]}\right\}$$
$$-(\theta_2+\theta_3 a^*)\left\{\frac{\exp[\beta_0+\beta_1 a+\beta_2' c]}{1+\exp\left[\beta_0+\beta_1 a+\beta_2' c\right]} - \frac{\exp[\beta_0+\beta_1 a^*+\beta_2' c]}{1+\exp\left[\beta_0+\beta_1 a^*+\beta_2' c\right]}\right\}$$
$$= \theta_3(a-a^*)\left\{\frac{\exp[\beta_0+\beta_1 a+\beta_2' c]}{1+\exp\left[\beta_0+\beta_1 a+\beta_2' c\right]} - \frac{\exp[\beta_0+\beta_1 a^*+\beta_2' c]}{1+\exp\left[\beta_0+\beta_1 a^*+\beta_2' c\right]}\right\}$$

Supplementary References

Valeri, Linda, and Tyler J. Vanderweele. 2013. “Mediation Analysis Allowing for Exposure-Mediator Interactions and Causal Interpretation: Theoretical Assumptions and Implementation with SAS and SPSS Macros.” *Psychological Methods* 18:137–50. doi: 10.1037/a0031034.