Supporting Information:

Technical Appendix

Intraclass correlations

The intraclass correlations presented in Figure 2 are based on multilevel mixed-effects linear regressions fitted using maximum likelihood. The models include three levels: multiple years of test scores (either grades 3 to 5 or grades 6 to 8) are nested within individuals, and individuals are nested within twin or sibling pairs. Accordingly, the analysis includes random intercepts for both an individual and a pair. The regression takes the following form:

$$Y_{gij} = \alpha_{000} + \mu_{00j} + \pi_{0ij} + \varepsilon_{gij} \tag{1}$$

with subscripts g used for grade, i for individual, and j for pair. In the regression, α_{000} is a fixed intercept representing grand mean; μ_{00j} is pair specific random intercept (pair deviation from fixed intercept); π_{0ij} is an individual specific random intercept (individual deviation from pair predicted outcome); ε_{gij} is a residual (grade specific deviation from individual predicted outcome). Level 1 of the model is $Y_{gij} = \beta_{0ij} + \varepsilon_{gij}$; level 2 is $\beta_{0ij} = \delta_{00j} + \pi_{0ij}$; and level 3 is $\delta_{00j} = \alpha_{000} + \mu_{00j}$. We model the residuals to have autoregressive structure of order one. We fit separately $2\times2\times2\times3$ combinations:

- Two outcomes: reading and math
- Two grade levels: 3 to 5 or 6 to 8
- Two pair types: twins and non-twin siblings
- Three gender-composition types: male-male, female-female, male-female

This model allows us to compute within-person, within-pair and between pair variances for each of the 24 combinations listed above. Namely, level 1 variance (within person) is V_e; level 2 variance (within pair) is $V_{\pi0}$; and level 3 variance (between pair) is $V_{\mu00}$. Once we obtain the three variances from the model we can compute total pair variance $V_{total} = V_{\pi0} + V_{\mu00}$, which is just a sum of within and between pair variances. The intraclass correlation is then a ratio of between pair variance to total pair variance i.e. $ICC = \frac{V_{\mu00}}{V_{total}}$.

Variance decomposition

We use the same method and exactly the same equation for the variance decomposition shown in Figures 3 and 4, with one specific modification. Namely, we compute variances for $2\times2\times2\times2\times3$ groups:

- Two outcomes: reading and math
- Two grade levels: 3 to 5 and 6 to 8

- Two gender composition types: same-sex and opposite-sex
- Two pair types: twins and non-twin siblings
- Three levels of SES: low, medium, high

For the SES levels we repeat the analysis separately for maternal education (high school dropout, high school graduate, college graduate), zip code income terciles, and PCA'ed SES index terciles.

In Figure 3 we directly plot between and within variances obtained from the model for the twin sample, which yields 3x2x2x2x2 = 48 estimates.

In Figure 4 we compute ICCs for each SES level, pair type, outcome, grade level and sex composition, which again yields 48 estimates. ICCs are computed as a ratio of between pair variance to total pair variance for each of the groups.

We compute ICCs and perform variance decomposition using Stata, and the code is available online.

ACE model with continuous moderator

The standard ACE model decomposes genetic phenotype into three factors: additive genetic factors (A), common environment factors (C), and specific environmental factors (E). It can be written mathematically as $V_p = V_A + V_C + V_E$, where V_p is a total variance of the trait and the three linearly additive variances represent factors A, C and E. This model implies that $V_A + V_C + V_E = 1$, and heritability is defined as $H = \frac{V_A}{V_p}$.

In our particular case, we are seeking to understand whether genetic influence (A) is moderated by socioeconomic status of family (SES moderator M). Since we are interested in the interactions with childhood conditions, we expand the model to include A', C' and E' components where $A' = A \times M$; $C' = C \times M$; $E' = E \times M$. Central to our interest is an interaction term A' that represents gene × SES interaction. We use two continuous SES moderators in this analysis: maternal years of education and PCA'ed SES index. Thus, the variance in expanded model changes to $V_{p|M} = (A + A')^2 + (C + C')^2 + (E + E')^2$, and the standardization condition takes a form of $\frac{(A+A')^2}{V_{p|M}} + \frac{(C+C')^2}{V_{p|M}} + \frac{(E+E')^2}{V_{p|M}} = 1$.

Identification of parameters for this model with twin data usually has used information on zygosity of twins, relying on the fact that monozygotic twins (MZ) share all their genes, while dizygotic twins (DZ) share on average half of their genes by descent. Thus, for MZ twins the observed covariance between twins equals $V_A + V_C$ while for DZ twins this covariance is $0.5 \cdot V_A + V_C$. Similarly when conditioning on continuous moderator we simply replace V_A and V_C with $(A + A')^2$ and $(C + C')^2$, respectively.

In the absence of information on zygosity, we use the observed gender composition of twin pair as a proxy to fit the model whose results are shown in Table 1. This is possible because all opposite-sex twin pairs are dizygotic (DZ), while same-sex twin pairs are a mix of dizygotic (DZ) and monozygotic (MZ) phenotypes. We standardize test scores within sex to remove any mean differences between sexes.

In order to proceed with modeling, however, we need a value for rSS which is genetic relatedness of the same-sex twin group. It can be estimated from $rSS = \frac{N-M}{N} + 0.5\frac{M}{N}$, where N is the number of same-sex twins in the sample and M is the number of opposite-sex twins in the sample. The first right-hand side term is a proportion of monozygotic (MZ) twins in the group, while the latter is a proportion of dizygotic (DZ) twins (multiplied by their relatedness of .5). Given that same-sex twins are often composed of about equal numbers of MZ and DZ twins, .75 is sometimes used as an approximation of rSS. We compute rSS directly from our data, and in the main sample that yields a value of 0.76 in grades 3 to 5 and value of 0.77 in grades 6 to 8. We test the robustness of the results for alternative values of rSS: 0.700, 0.725, 0.750, 0.775, 0.800. Based on this we run 2×2×6 models using twin data:

- Two outcomes: reading and math
- Two grade levels: 3 to 5 and 6 to 8
- Six values for rSS assumption

We compute these models using MPlus, and the code is available online.

Figures and tables

Table S1: Demographic characteristics of mothers

	(1)	(2)	(3)	(4)
		Births 1994-2002		
Characteristic	All	Matched to school records	Final twin sample	Final sibling sample
African-American	21.9	24.1	25.6	30.7
Hispanic	23.8	24.2	18.0	25.2
Immigrant	24.0	23.4	18.0	22.2
Married	65.2	62.4	68.0	62.2
HS dropout	20.1	21.8	15.2	25.4
College graduate	21.3	18.0	24.1	18.4
Age 21 or below	21.4	23.2	14.5	24.1
Age 37 or above	7.5	7.1	10.7	4.8
N	1,636,968	1,312,345	24,640	274,786

Notes: The first column presents fractions in total population of children born in Florida between 1994 and 2002. The second column presents fractions in total population of children born between 1994 and 2002 linked to Florida school records. The third column presents fractions in final twin sample used in the empirical analysis. The fourth column presents fractions in final sibling sample used in the analysis.

Table S2: Alternative variance components model. Moderator: Maternal years of education

Test	Grades	A (additive genetic)	M (SES measure)	C (common environment)	E (non-shared environment)	A' (genetic x SES)	95% CI for A'		C' (common env. x SES)	95% CI for C'		E' (non-shared env. x SES)	95% CI for E'		N
							Lower	Upper		Lower	Upper		Lower	Upper	
Math	3 to 5	0.590	0.143	0.052	0.209	-0.101	-0.120	-0.082	0.118	0.086	0.150	0.030	0.020	0.040	34,432
Reading	3 to 5	0.619	0.149	0.003	0.224	-0.030	-0.073	0.013	0.151	0.126	0.175	0.016	-0.005	0.037	
Math	6 to 8	0.628	0.169	0.000	0.181	-0.050	-0.110	0.010	-0.173	-0.206	-0.139	-0.018	-0.048	0.012	21,653
Reading	6 to 8	0.594	0.166	0.017	0.197	-0.077	-0.130	-0.023	0.166	0.119	0.214	0.036	0.012	0.060	

Notes: This table is based on variance components model. Column (1) lists a test - either mathematics or reading while column (2) lists test grades. The first two models (grades 3 to 5) use relatedness value of 0.76 while the latter two models (grades 6 to 8) use relatedness value of 0.77. Relatedness is defined as $R_{ss} = \frac{N-M}{N} + 0.5\frac{M}{N}$ where N is number of same-sex twins and M is number of opposite-sex twins. Subsequent columns present variances due to additive genetic effects (A; column 3); socioeconomic status measure which in this case is years of maternal education at birth (M; column 4); variances due to shared environment (C; column 5) and non-shared environment (E; column 6). Columns (7) to (9) present a moderator term of interest for additive genetic effects (A') with 95% confidence interval. Columns (10) to (12) present a moderator term for shared environment (C') with 95% confidence interval. Columns (13) to (15) present moderator term for non-shared environment (E') with 95% confidence interval. Column (16) presents sample sizes used in estimation. Scarr-Rowe hypothesis requires estimate in column (7) to be positive and statistically significant.

Table S3: Robustness of alternative variance components model. Moderator: Maternal years of education

(1) Test	(2) R_{SS}	(3) Grades	(4) A (additive genetic)	(5) M (SES measure)	(6) C (common environment)	(7) E (non-sh. environment)	(8) A' (genetic x SES)	(9) 95% CI for A' Lower	(10) Upper	(11) C' (common env. X SES)	(12) 95% CI for C' Lower	(13) Upper	(14) E' (non-sh. env. X SES)	(15) 95% CI for E' Lower	(16) Upper	(17) N
Math	0.700	3 to 5	0.706	0.144	0.004	0.142	-0.069	-0.094	-0.044	0.141	0.113	0.170	0.030	0.010	0.049	34,432
Reading		3 to 5	0.674	0.148	0.001	0.174	-0.037	-0.061	-0.012	0.143	0.118	0.169	0.026	0.008	0.044	
Math		6 to 8	0.691	0.168	0.000	0.123	-0.052	-0.083	-0.020	-0.164	-0.195	-0.132	-0.012	-0.038	0.015	21,653
Reading		6 to 8	0.674	0.166	0.001	0.136	-0.049	-0.082	-0.016	0.173	0.144	0.202	0.037	0.010	0.064	
Math	0.725	3 to 5	0.669	0.144	0.014	0.167	-0.081	-0.107	-0.054	0.137	0.104	0.169	0.030	0.014	0.047	34,432
Reading		3 to 5	0.651	0.148	0.001	0.195	-0.036	-0.065	-0.007	0.146	0.121	0.171	0.022	0.004	0.041	
Math		6 to 8	0.667	0.168	0.000	0.144	-0.051	-0.087	-0.015	-0.167	-0.198	-0.136	-0.014	-0.040	0.011	21,653
Reading		6 to 8	0.651	0.166	0.001	0.158	-0.052	-0.092	-0.012	0.175	0.145	0.205	0.033	0.006	0.060	
Math	0.750	3 to 5	0.613	0.143	0.040	0.197	-0.096	-0.117	-0.075	0.123	0.090	0.157	0.031	0.020	0.042	34,432
Reading		3 to 5	0.629	0.148	0.002	0.215	-0.033	-0.071	0.005	0.149	0.125	0.174	0.018	-0.002	0.038	
Math		6 to 8	0.645	0.168	0.000	0.166	-0.050	-0.095	-0.006	-0.170	-0.202	-0.138	-0.017	-0.043	0.010	21,653
Reading		6 to 8	0.626	0.166	0.004	0.179	-0.059	-0.111	-0.008	0.175	0.139	0.210	0.032	0.004	0.060	
Math	0.775	3 to 5	0.557	0.143	0.070	0.226	-0.106	-0.123	-0.089	0.110	0.080	0.141	0.028	0.019	0.037	34,432
Read		3 to 5	0.601	0.149	0.008	0.237	-0.020	-0.067	0.026	0.153	0.129	0.177	0.011	-0.010	0.032	
Math		6 to 8	0.623	0.169	0.000	0.185	-0.049	-0.116	0.018	-0.174	-0.208	-0.139	-0.019	-0.051	0.013	21,653
Reading		6 to 8	0.581	0.165	0.024	0.203	-0.083	-0.131	-0.035	0.162	0.113	0.210	0.037	0.017	0.058	
Math	0.800	3 to 5	0.507	0.142	0.096	0.250	-0.112	-0.128	-0.096	0.101	0.073	0.129	0.024	0.016	0.032	34,432
Reading		3 to 5	0.521	0.147	0.061	0.267	-0.091	-0.109	-0.073	0.105	0.069	0.140	0.033	0.025	0.041	
Math		6 to 8	0.593	0.169	0.008	0.206	-0.027	-0.122	0.068	-0.179	-0.209	-0.150	-0.029	-0.066	0.008	21,653
Reading		6 to 8	0.518	0.164	0.063	0.230	-0.103	-0.130	-0.076	0.141	0.101	0.181	0.038	0.027	0.049	

Notes: This table is based on variance components model. Column (1) lists a test - either mathematics or reading while column (3) lists test grades. Column (2) presents assumptions regarding relatedness of same-sex twin group. For each combination of test type and grade range we test robustness to five relatedness values. The preferred relatedness values in Table 1 are 0.76 (grades 3 to 5) and 0.77 (grades 6 to 8). Relatedness is defined as $R_{ss} = \frac{N-M}{N} + 0.5\frac{M}{N}$ where N is number of same-sex twins and M is number of opposite-sex twins. Subsequent columns present variances due to additive genetic effects (A; column 4); socioeconomic status measure which in our case is years of maternal education at birth (M; column 5); variance due to shared environment (C; column 6) and non-shared environment (E; column 7). Columns (8) to (10) present a moderator term of interest for additive genetic effects (A') with 95% confidence interval. Columns (11) to (13) present a moderator term for shared environment (C') with 95% confidence interval. Columns (14) to (16) present moderator term for non-shared environment (E') with 95% confidence interval. Column (17) presents sample sizes used in estimation. Scarr-Rowe hypothesis requires estimate in column (8) to be positive and statistically significant.

Table S4: Alternative variance components model. Moderator: PCA SES index (excluding zip code income)

Test	Grades	A (additive genetic)	M (SES measure)	C (common environment)	E (non-shared environment)	A' (genetic x SES)	95% CI for A'		C' (common env. x SES)	95% CI for C'		E' (non-shared env. x SES)	95% CI for E'		N
							Lower	Upper		Lower	Upper		Lower	Upper	
Math	3 to 5	0.563	0.150	0.075	0.219	-0.050	-0.071	-0.030	0.029	-0.013	0.070	-0.003	-0.015	0.008	34,270
Reading	3 to 5	0.569	0.151	0.049	0.238	-0.021	-0.041	-0.001	-0.001	-0.046	0.044	-0.002	-0.013	0.009	
Math	6 to 8	0.570	0.175	0.054	0.196	-0.030	-0.063	0.003	-0.008	-0.085	0.068	-0.039	-0.057	-0.022	21,526
Reading	6 to 8	0.540	0.164	0.076	0.214	-0.030	-0.059	-0.001	0.022	-0.035	0.079	0.009	-0.006	0.025	

Notes: See Table S2 for detailed notes. Socioeconomic status measure (M) used in this table is based on PCA of: maternal years of education, medicaid paid birth, parents married, father present or father absent.

Table S5: Robustness of alternative variance components model. Moderator: PCA SES index (excluding zip code income)

(1) Test	(2) R_{SS}	(3) Grades	(4) A (additive genetic)	(5) M (SES measure)	(6) C (common environment)	(7) E (non-sh. environment)	(8) A' (genetic x SES)	(9) 95% CI for A' Lower	(10) Upper	(11) C' (common env. X SES)	(12) 95% CI for C' Lower	(13) Upper	(14) E' (non-sh. env. X SES)	(15) 95% CI for E' Lower	(16) Upper	(17) N
Math	0.700	3 to 5	0.717	0.150	0.001	0.140	-0.036	-0.051	-0.021	0.006	-0.097	0.109	-0.006	-0.021	0.009	34,270
Reading		3 to 5	0.686	0.151	0.000	0.171	-0.021	-0.031	-0.012	0.000	-0.052	0.051	0.001	-0.010	0.012	
Math		6 to 8	0.702	0.175	0.000	0.118	-0.033	-0.045	-0.021	0.000	-0.105	0.105	-0.042	-0.057	-0.026	21,526
Reading		6 to 8	0.702	0.164	0.000	0.129	-0.019	-0.031	-0.007	0.000	-0.094	0.095	0.010	-0.006	0.025	
Math	0.725	3 to 5	0.645	0.150	0.035	0.177	-0.044	-0.062	-0.026	0.026	-0.022	0.073	-0.003	-0.017	0.011	34,270
Reading		3 to 5	0.658	0.151	0.005	0.194	-0.021	-0.033	-0.010	0.000	-0.052	0.053	0.000	-0.010	0.010	
Math		6 to 8	0.679	0.175	0.000	0.140	-0.033	-0.044	-0.021	0.000	-0.126	0.127	-0.054	-0.041	-0.027	21,526
Reading		6 to 8	0.645	0.164	0.024	0.162	-0.024	-0.047	-0.001	0.020	-0.051	0.092	0.011	-0.007	0.029	
Math	0.750	3 to 5	0.584	0.150	0.064	0.209	-0.049	-0.069	-0.029	0.029	-0.014	0.071	-0.003	-0.015	0.009	34,270
Reading		3 to 5	0.591	0.151	0.038	0.228	-0.021	-0.040	-0.003	-0.001	-0.048	0.046	-0.002	-0.013	0.010	
Math		6 to 8	0.615	0.175	0.031	0.173	-0.031	-0.062	-0.001	-0.006	-0.098	0.086	-0.040	-0.058	-0.021	21,526
Reading		6 to 8	0.582	0.164	0.055	0.193	-0.028	-0.056	-0.001	0.023	-0.039	0.085	0.010	-0.007	0.027	
Math	0.775	3 to 5	0.533	0.150	0.089	0.234	-0.052	-0.073	-0.031	0.028	-0.011	0.067	-0.004	-0.015	0.007	34,270
Read		3 to 5	0.537	0.151	0.065	0.254	-0.021	-0.042	0.000	-0.002	-0.044	0.040	-0.003	-0.014	0.008	
Math		6 to 8	0.560	0.175	0.060	0.201	-0.030	-0.063	0.004	-0.009	-0.083	0.065	-0.039	-0.056	-0.022	21,526
Reading		6 to 8	0.530	0.164	0.080	0.219	-0.030	-0.059	-0.001	0.022	-0.034	0.077	0.009	-0.006	0.024	
Math	0.800	3 to 5	0.489	0.150	0.110	0.256	-0.053	-0.075	-0.031	0.027	-0.010	0.063	-0.006	-0.016	0.004	34,270
Reading		3 to 5	0.493	0.151	0.087	0.277	-0.020	-0.043	0.002	-0.003	-0.042	0.035	-0.004	-0.014	0.006	
Math		6 to 8	0.513	0.175	0.082	0.225	-0.028	-0.063	0.006	-0.011	-0.075	0.053	-0.039	-0.054	-0.024	21,526
Reading		6 to 8	0.486	0.164	0.102	0.241	-0.031	-0.061	-0.001	0.020	-0.031	0.070	0.007	-0.006	0.021	

Notes: See Table S3 for detailed notes. Socioeconomic status measure (M) used in this table is based on PCA of: maternal years of education, medicaid paid birth, parents married, father present or father absent.

Table S6: Alternative variance components model. Moderator: PCA SES index (including zip code income)

Test	Grades	A (additive genetic)	M (SES measure)	C (common environment)	E (non-shared environment)	A' (genetic x SES)	95% CI for A'		C' (common env. x SES)	95% CI for C'		E' (non-shared env. x SES)	95% CI for E'		N
							Lower	Upper		Lower	Upper		Lower	Upper	
Math	3 to 5	0.573	0.166	0.049	0.219	-0.051	-0.070	-0.032	0.024	-0.020	0.068	-0.004	-0.015	0.008	32,991
Reading	3 to 5	0.567	0.168	0.032	0.240	-0.028	-0.045	-0.012	0.000	-0.042	0.043	0.000	-0.010	0.010	
Math	6 to 8	0.573	0.194	0.029	0.196	-0.034	-0.065	-0.003	-0.007	-0.102	0.089	-0.040	-0.057	-0.023	20,639
Reading	6 to 8	0.521	0.184	0.068	0.220	-0.028	-0.054	-0.002	0.002	-0.048	0.052	0.007	-0.007	0.022	

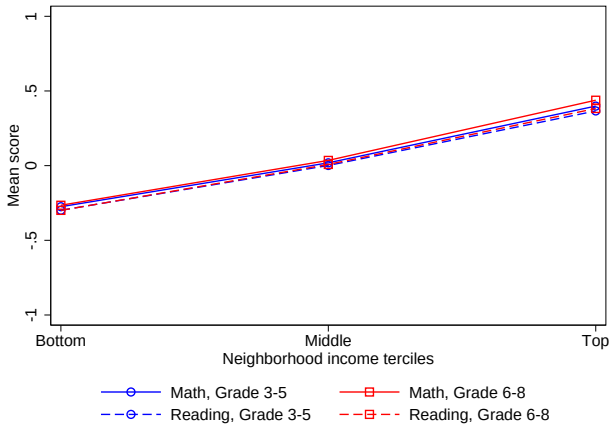
Notes: See Table S2 for detailed notes. Socioeconomic status measure (M) used in this table is based on PCA of: maternal years of education, medicaid paid birth, parents married, father present, father absent and median income at zip code of residence at the time of child's birth.

Table S7: Robustness of alternative variance components model. Moderator: PCA SES index (including zip code income)

(1) Test	(2) R_{SS}	(3) Grades	(4) A (additive genetic)	(5) M (SES measure)	(6) C (common environment)	(7) E (non-sh. environment)	(8) A' (genetic x SES)	(9) 95% CI for A' Lower	(10) Upper	(11) C' (common env. X SES)	(12) 95% CI for C' Lower	(13) Upper	(14) E' (non-sh. env. X SES)	(15) 95% CI for E' Lower	(16) Upper	(17) N
Math	0.700	3 to 5	0.692	0.166	0.000	0.151	-0.041	-0.050	-0.031	0.000	-0.060	0.060	-0.004	-0.016	0.008	32,991
Reading		3 to 5	0.659	0.168	0.000	0.181	-0.028	-0.038	-0.019	0.000	-0.045	0.045	0.004	-0.007	0.015	
Math		6 to 8	0.667	0.194	0.000	0.131	-0.036	-0.048	-0.023	0.000	-0.097	0.097	-0.042	-0.057	-0.027	20,639
Reading		6 to 8	0.669	0.184	0.000	0.141	-0.026	-0.038	-0.014	0.000	-0.063	0.063	0.014	-0.001	0.029	
Math	0.725	3 to 5	0.656	0.166	0.010	0.177	-0.043	-0.060	-0.027	0.015	-0.040	0.071	-0.004	-0.017	0.009	32,991
Reading		3 to 5	0.638	0.168	0.000	0.202	-0.028	-0.037	-0.018	0.000	-0.047	0.047	0.002	-0.008	0.012	
Math		6 to 8	0.646	0.194	0.000	0.151	-0.035	-0.047	-0.023	0.000	-0.110	0.110	-0.041	-0.055	-0.028	20,639
Reading		6 to 8	0.624	0.184	0.016	0.168	-0.027	-0.045	-0.009	0.003	-0.058	0.064	0.011	-0.004	0.027	
Math	0.750	3 to 5	0.594	0.166	0.039	0.208	-0.049	-0.068	-0.031	0.023	-0.022	0.069	-0.004	-0.016	0.008	32,991
Reading		3 to 5	0.590	0.168	0.022	0.229	-0.028	-0.043	-0.013	0.000	-0.044	0.044	0.001	-0.010	0.011	
Math		6 to 8	0.618	0.194	0.006	0.173	-0.035	-0.055	-0.015	-0.004	-0.124	0.116	-0.041	-0.056	-0.026	20,639
Reading		6 to 8	0.563	0.184	0.047	0.200	-0.028	-0.052	-0.004	0.003	-0.051	0.057	0.009	-0.006	0.025	
Math	0.775	3 to 5	0.543	0.166	0.064	0.234	-0.052	-0.072	-0.033	0.024	-0.017	0.065	-0.005	-0.016	0.006	32,991
Read		3 to 5	0.536	0.168	0.048	0.256	-0.029	-0.047	-0.010	0.000	-0.040	0.040	-0.001	-0.011	0.010	
Math		6 to 8	0.563	0.194	0.034	0.202	-0.034	-0.066	-0.001	-0.007	-0.098	0.084	-0.040	-0.057	-0.023	20,639
Reading		6 to 8	0.511	0.184	0.073	0.226	-0.028	-0.055	-0.001	0.002	-0.047	0.051	0.007	-0.007	0.021	
Math	0.800	3 to 5	0.500	0.166	0.085	0.257	-0.054	-0.075	-0.033	0.023	-0.015	0.061	-0.006	-0.016	0.004	32,991
Reading		3 to 5	0.491	0.168	0.070	0.278	-0.028	-0.048	-0.008	-0.001	-0.038	0.036	-0.002	-0.011	0.008	
Math		6 to 8	0.516	0.194	0.057	0.225	-0.033	-0.067	0.001	-0.008	-0.084	0.067	-0.040	-0.055	-0.025	20,639
Reading		6 to 8	0.469	0.184	0.094	0.247	-0.028	-0.056	0.000	0.001	-0.045	0.046	0.005	-0.007	0.018	

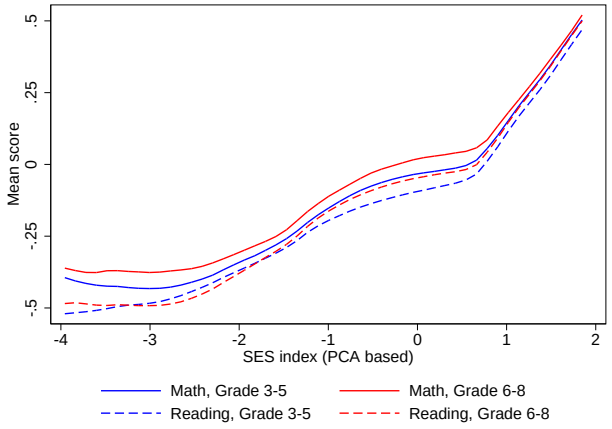
Notes: See Table S3 for detailed notes. Socioeconomic status measure (M) used in this table is based on PCA of: maternal years of education, medicaid paid birth, parents married, father present, father absent and median income at zip code of residence at the time of child's birth.

Figure S1: Neighborhood income at birth and average achievement test score for combined twin and sibling pairs sample



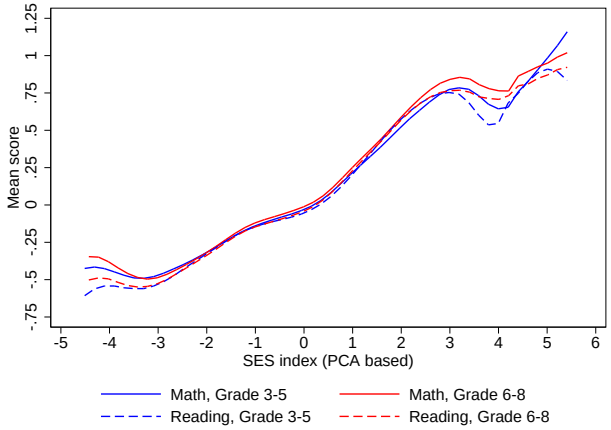
Notes: This figure plots means of gender-standardized test scores in mathematics and reading over zip-code level neighborhood income terciles at birth (separated by age group and test type). Sample includes all twin pairs and closely spaced sibling pairs with available test scores. Closely spaced sibling pair is defined as two siblings having the same mother for whom the distance in months between births is the smallest among births to this mother between 1994 and 2002.

Figure S2: SES index (PCA excluding zip code income) at birth and average achievement test score for combined twin and sibling pairs sample



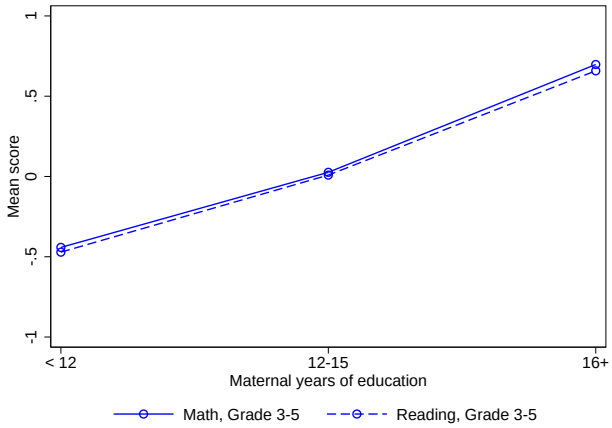
Notes: This figure plots means (smoothed polynomial) of gender-standardized test scores in mathematics and reading over SES index based on maternal years of education, medicaid paid birth, mother married, father present and father absent. Sample includes all twin pairs and closely spaced sibling pairs with available test scores. Closely spaced sibling pair is defined as two siblings having the same mother for whom the distance in months between births is the smallest among births to this mother between 1994 and 2002.

Figure S3: SES index (PCA including zip code income) at birth and average achievement test score for combined twin and sibling pairs sample



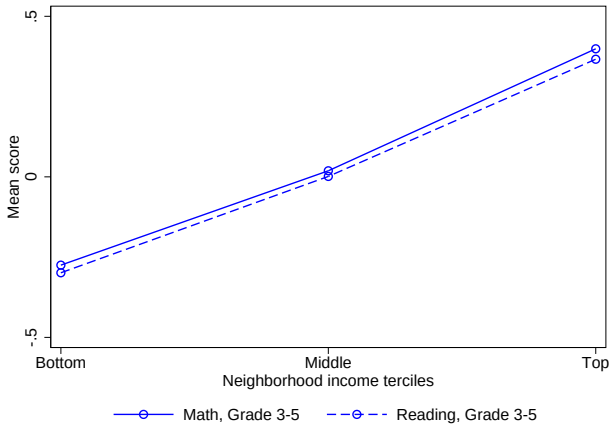
Notes: This figure plots means (smoothed polynomial) of gender-standardized test scores in mathematics and reading over SES index based on maternal years of education, medicaid paid birth, mother married, father present, father absent and median zip-code level neighborhood income at birth. Sample includes all twin pairs and closely spaced sibling pairs with available test scores. Closely spaced sibling pair is defined as two siblings having the same mother for whom the distance in months between births is the smallest among births to this mother between 1994 and 2002.

Figure S4: Maternal years of education and average Stanford achievement test score for combined twin and sibling pairs sample



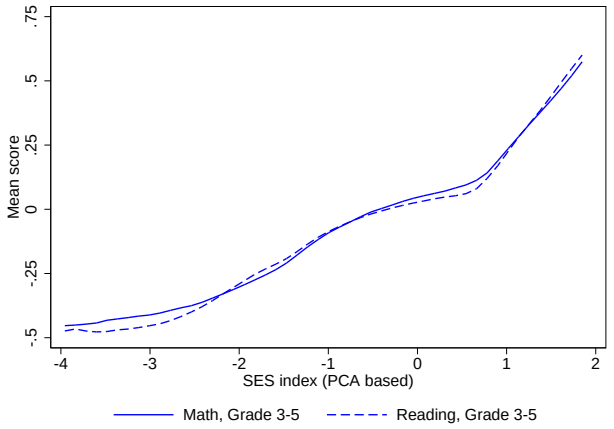
Notes: This figure plots means of gender-standardized Stanford achievement test scores in mathematics and reading over maternal years of education (separated by test type). Sample includes all twin pairs and closely spaced sibling pairs with available test scores. Closely spaced sibling pair is defined as two siblings having the same mother for whom the distance in months between births is the smallest among births to this mother between 1994 and 2002. Stanford achievement test is only available for grades 3 to 5.

Figure S5: Neighborhood income at birth and average Stanford achievement test score for combined twin and sibling pairs sample



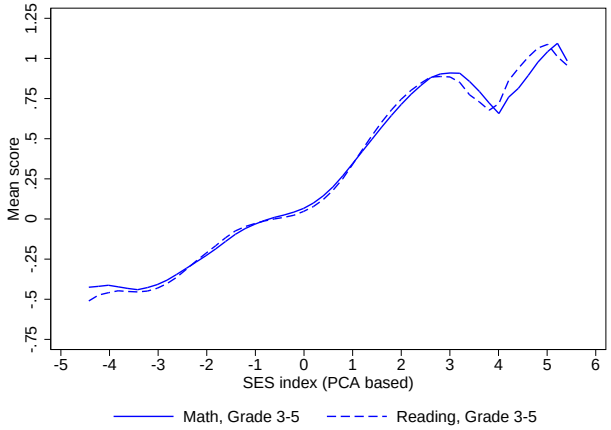
Notes: This figure plots means of gender-standardized Stanford achievement test scores in mathematics and reading over zip-code level neighborhood income terciles at birth (separated by test type). Sample includes all twin pairs and closely spaced sibling pairs with available test scores. Closely spaced sibling pair is defined as two siblings having the same mother for whom the distance in months between births is the smallest among births to this mother between 1994 and 2002. Stanford achievement test is only available for grades 3 to 5.

Figure S6: SES index (PCA excluding zip code income) at birth and average Stanford achievement test score for combined twin and sibling pairs sample



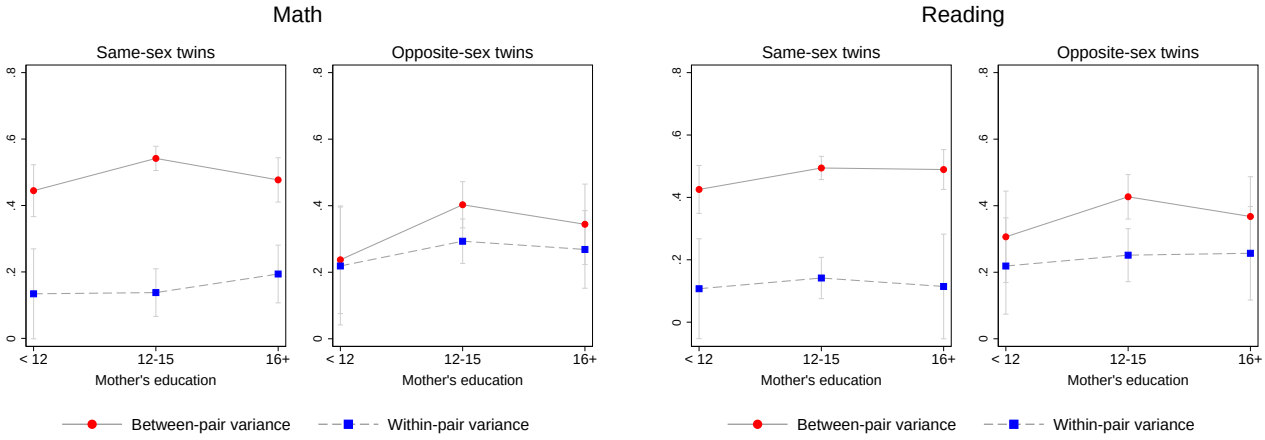
Notes: This figure plots means (smoothed polynomial) of gender-standardized Stanford achievement test scores in mathematics and reading over SES index based on maternal years of education, medicaid paid birth, mother married, father present and father absent (separated by test type). Sample includes all twin pairs and closely spaced sibling pairs with available test scores. Closely spaced sibling pair is defined as two siblings having the same mother for whom the distance in months between births is the smallest among births to this mother between 1994 and 2002. Stanford achievement test is only available for grades 3 to 5.

Figure S7: SES index (PCA including zip code income) at birth and average Stanford achievement test score for combined twin and sibling pairs sample



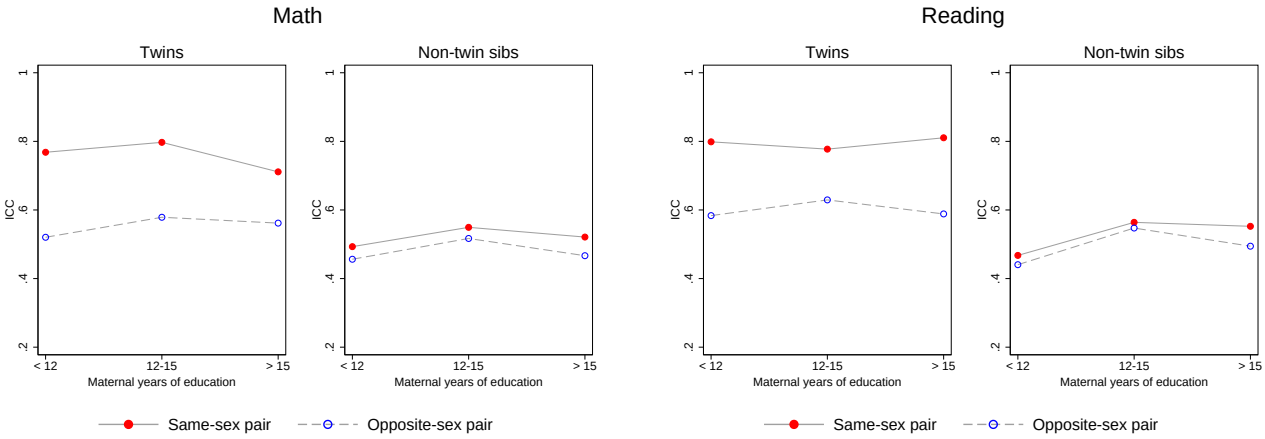
Notes: This figure plots means (smoothed polynomial) of gender-standardized Stanford achievement test scores in mathematics and reading over SES index based on maternal years of education, medicaid paid birth, mother married, father present, father absent and median zip-code level neighborhood income at birth (separated by test type). Sample includes all twin pairs and closely spaced sibling pairs with available test scores. Closely spaced sibling pair is defined as two siblings having the same mother for whom the distance in months between births is the smallest among births to this mother between 1994 and 2002. Stanford achievement test is only available for grades 3 to 5.

Figure S8: Between- and within-pair variance in Stanford achievement test for same-sex and opposite sex twins



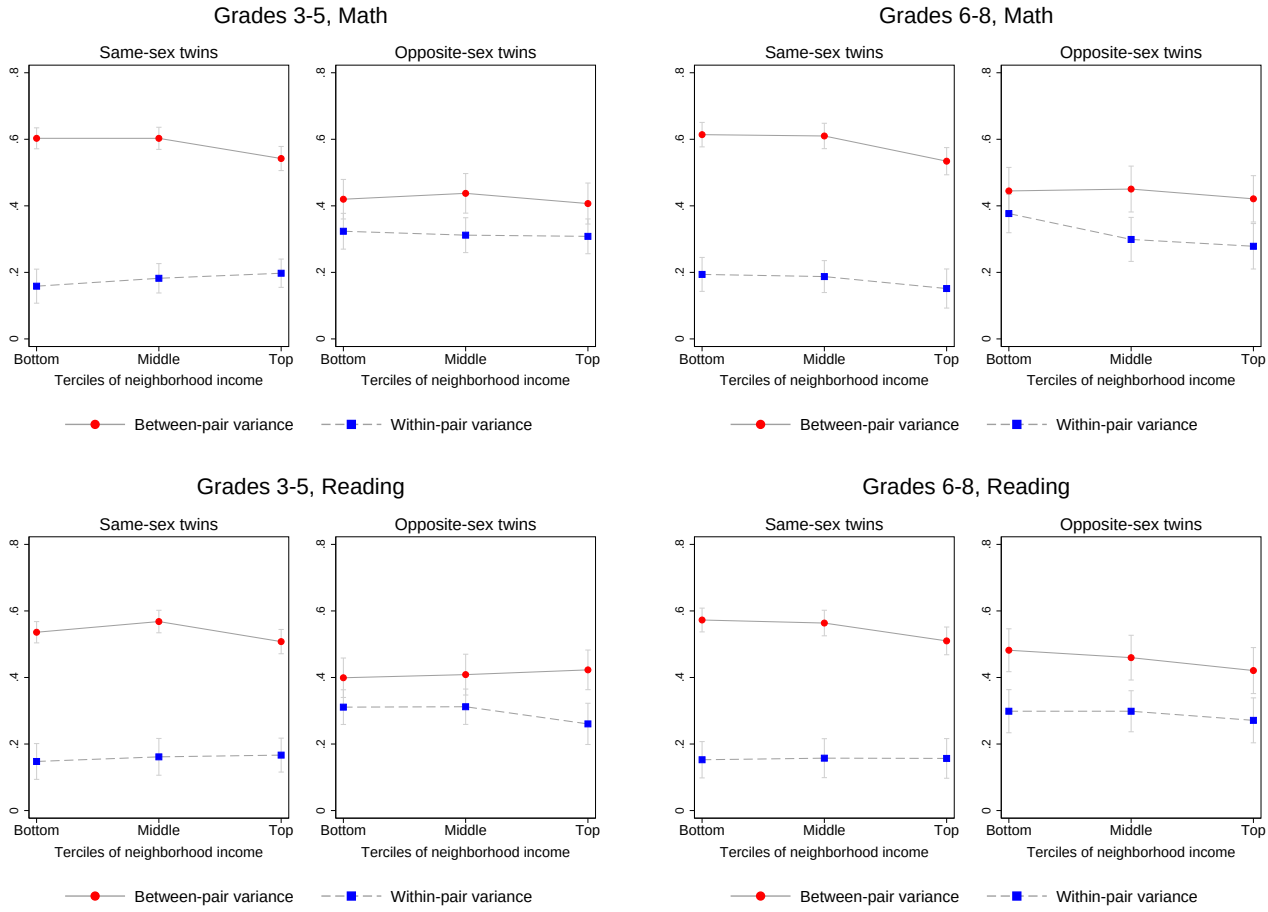
Notes: The left-hand side figures present between- and within-pair variance among same-sex and opposite-sex twins in grades 3 to 5 Stanford mathematics achievement test. The right-hand side figures present identical results for reading test. For estimation details see Figure 3.

Figure S9: Intraclass correlations for same-sex and opposite-sex twin and non-twin sibling pairs on Stanford achievement test



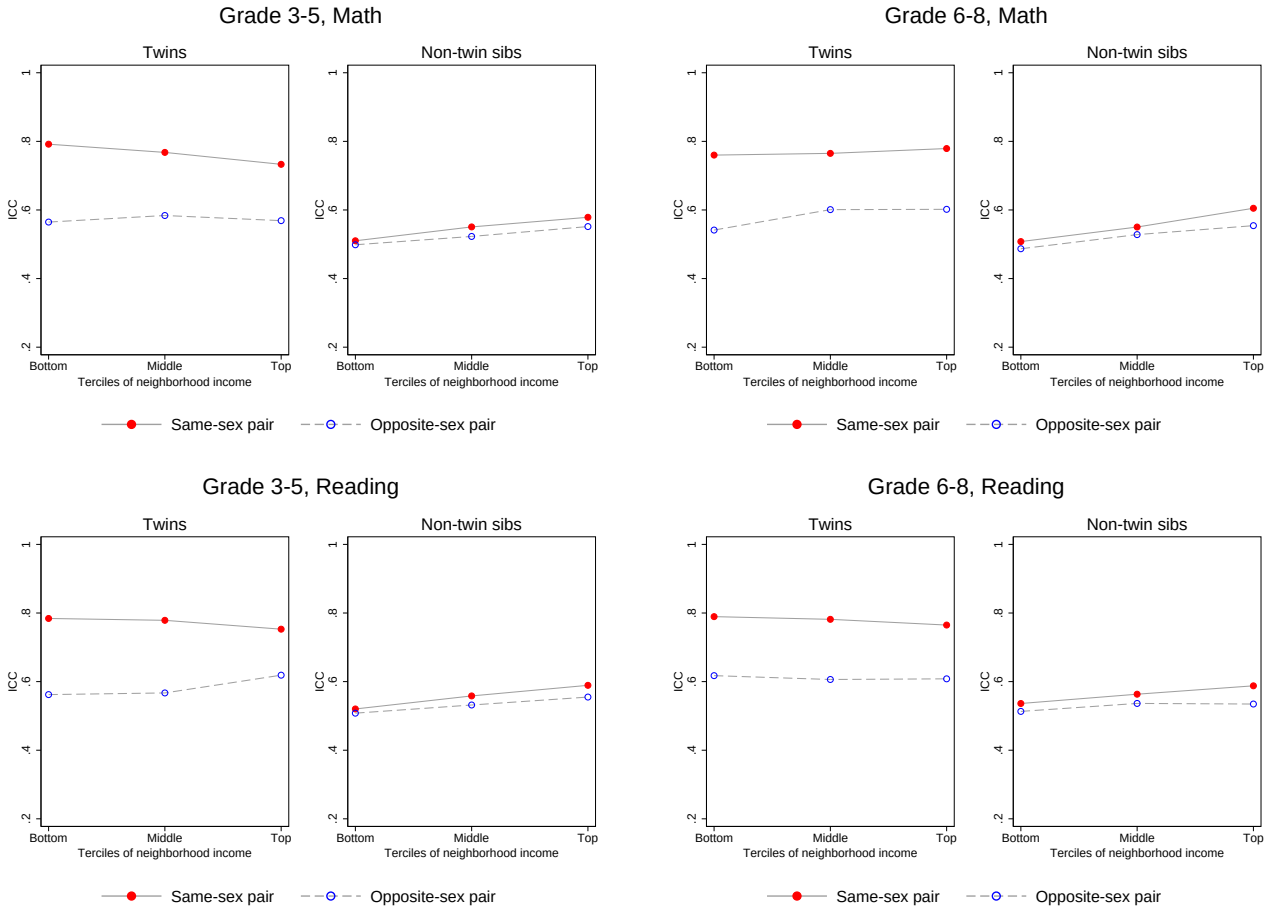
Note: The left-hand side figures present intraclass correlation coefficients among same-sex and opposite-sex pairs of twins and closely spaced siblings in grades 3 to 5 Stanford achievement test. The right-hand side figures present identical results for reading test. For estimation details see Figure 4.

Figure S10: Between- and within-pair variance in achievement test scores for same-sex and opposite-sex twins. Neighborhood income SES measure.



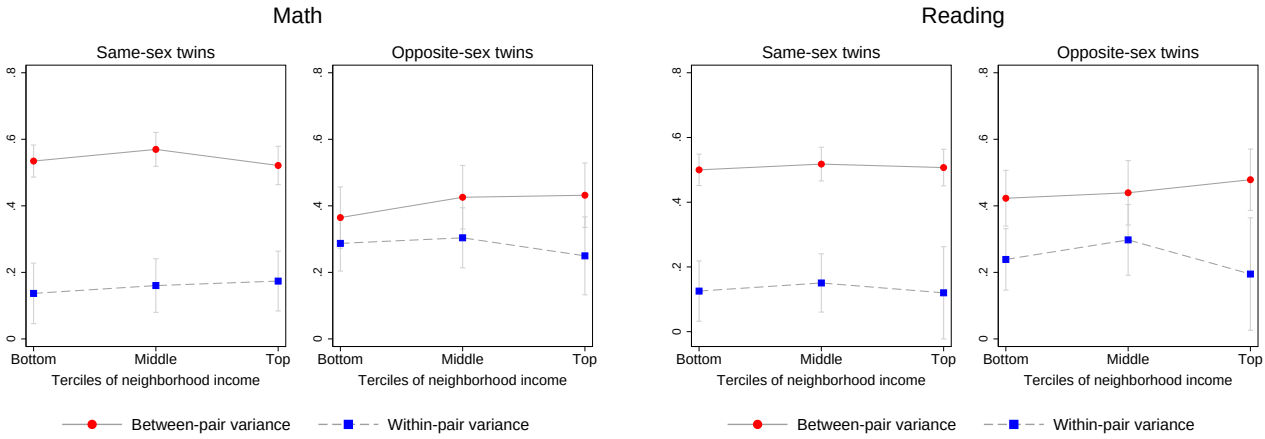
Note: The left-hand side figures present between- and within-pair variance among same-sex and opposite-sex twins in grades 3 to 5 mathematics (top) and reading (bottom) FCAT test scores. The right-hand side figures present identical results for grades 6 to 8. Socioeconomic status is measured based on zip-code level neighborhood income. For estimation details see Figure 3.

Figure S11: Intraclass correlation for same-sex and opposite-sex twin and non-twin sibling pairs. Neighborhood income SES measure.



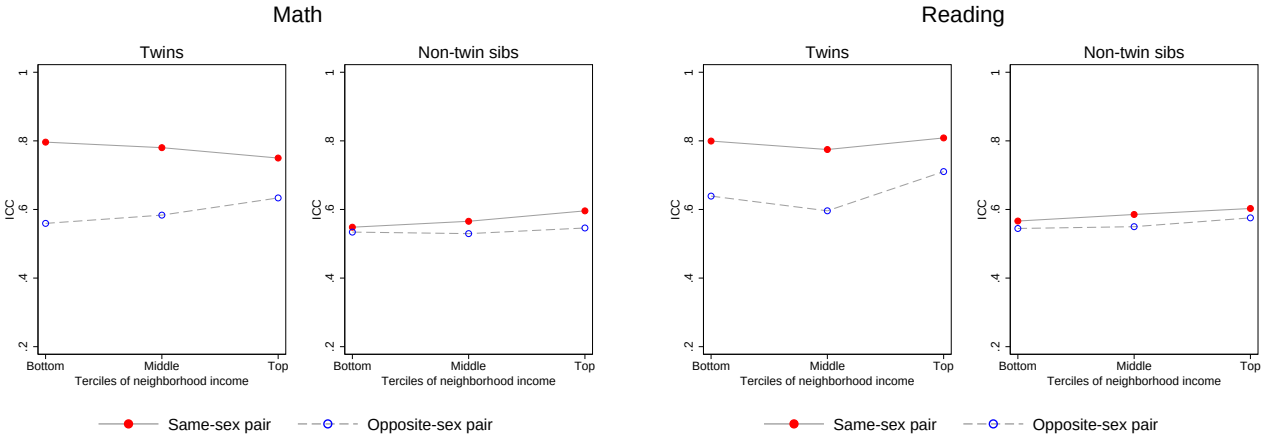
Note: The left-hand side figures present intraclass correlation coefficients among same-sex and opposite-sex pairs of twins and closely spaced siblings in grades 3 to 5 mathematics (top) and reading (bottom) FCAT test scores. The right-hand side figures present identical results for grades 6 to 8. Socioeconomic status is measured based on zip-code level neighborhood income. For estimation details see Figure 4.

Figure S12: Between- and within-pair variance in Stanford achievement test for same-sex and opposite-sex twins. Neighborhood income SES measure.



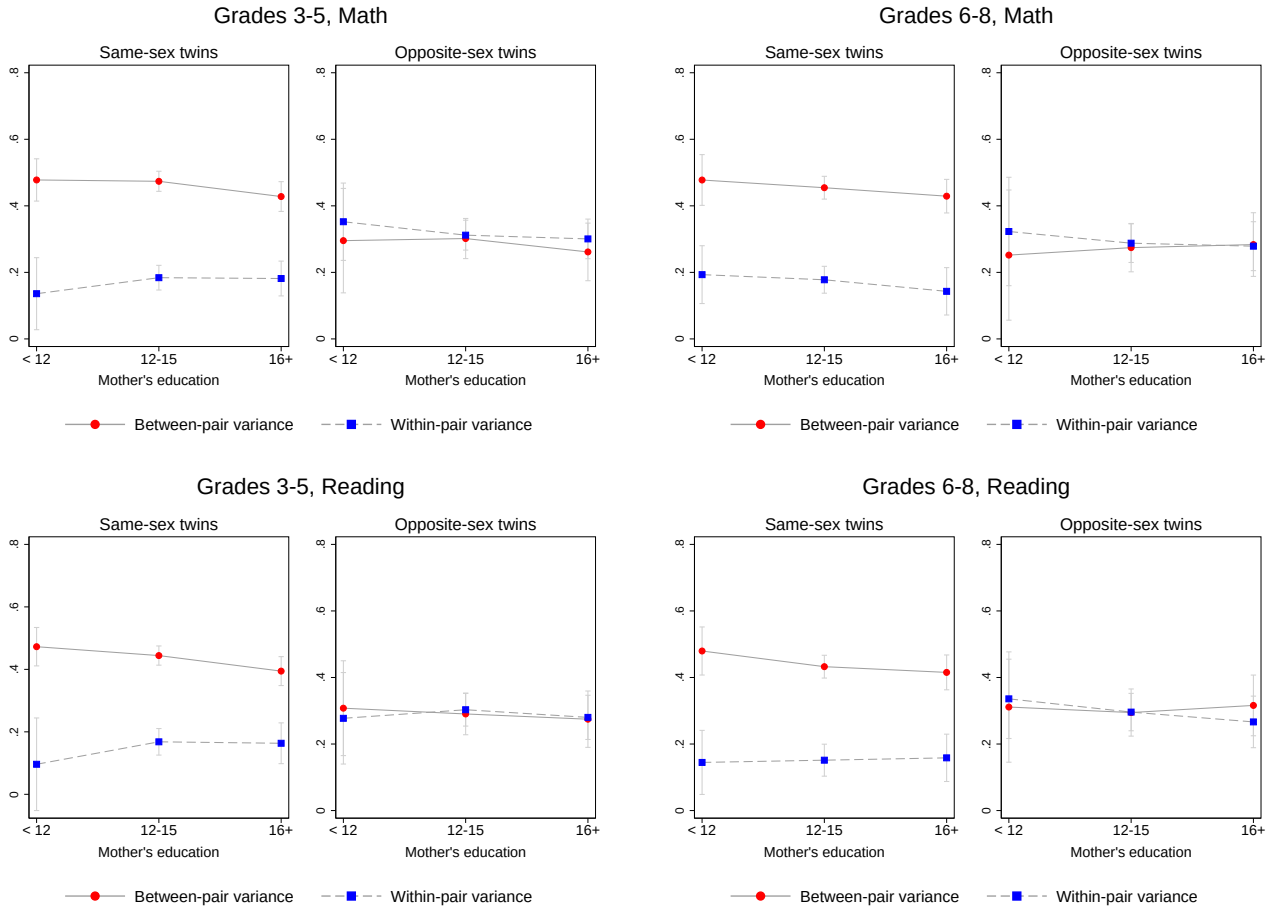
Notes: The left-hand side figures presents between- and within-pair variance among same-sex and opposite-sex twins in grades 3 to 5 Stanford mathematics achievement test. The right-hand side figures present identical results for reading test. Socioeconomic status is measured based on zip-code level neighborhood income. For estimation details see Figure 3.

Figure S13: Intraclass correlations for same-sex and opposite-sex twin and non-twin sibling pairs on Stanford achievement test. Neighborhood income SES measure.



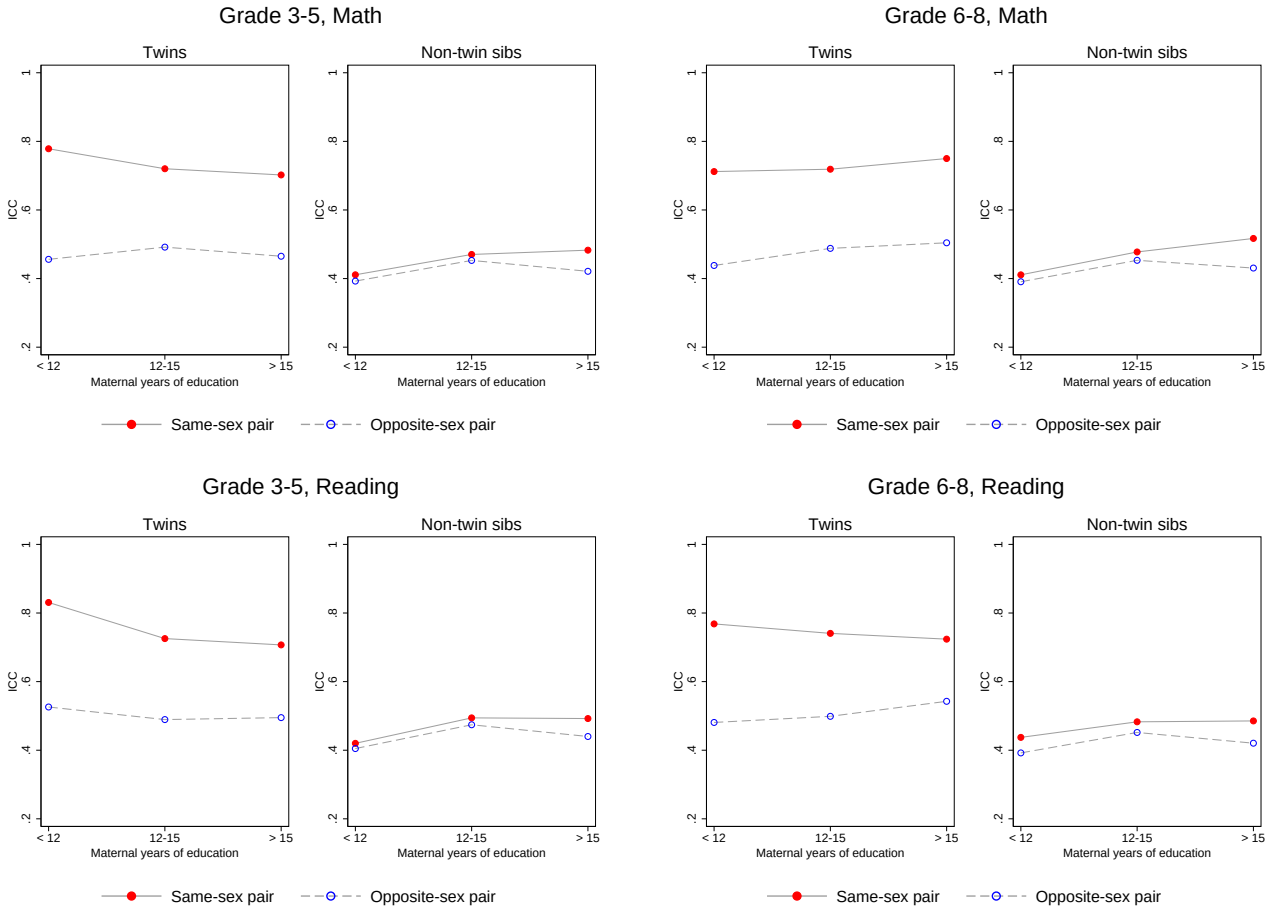
Note: The left-hand side figures presents intraclass correlations among same-sex and opposite-sex pairs of twins and non-twin siblings in grades 3 to 5 Stanford mathematics achievement test. The right-hand side figures present identical results for reading test. Socioeconomic status is measured based on zip-code level neighborhood income. For estimation details see Figure 4.

Figure S14: Between- and within-pair variance in achievement test scores for same-sex and opposite-sex twins. White mothers



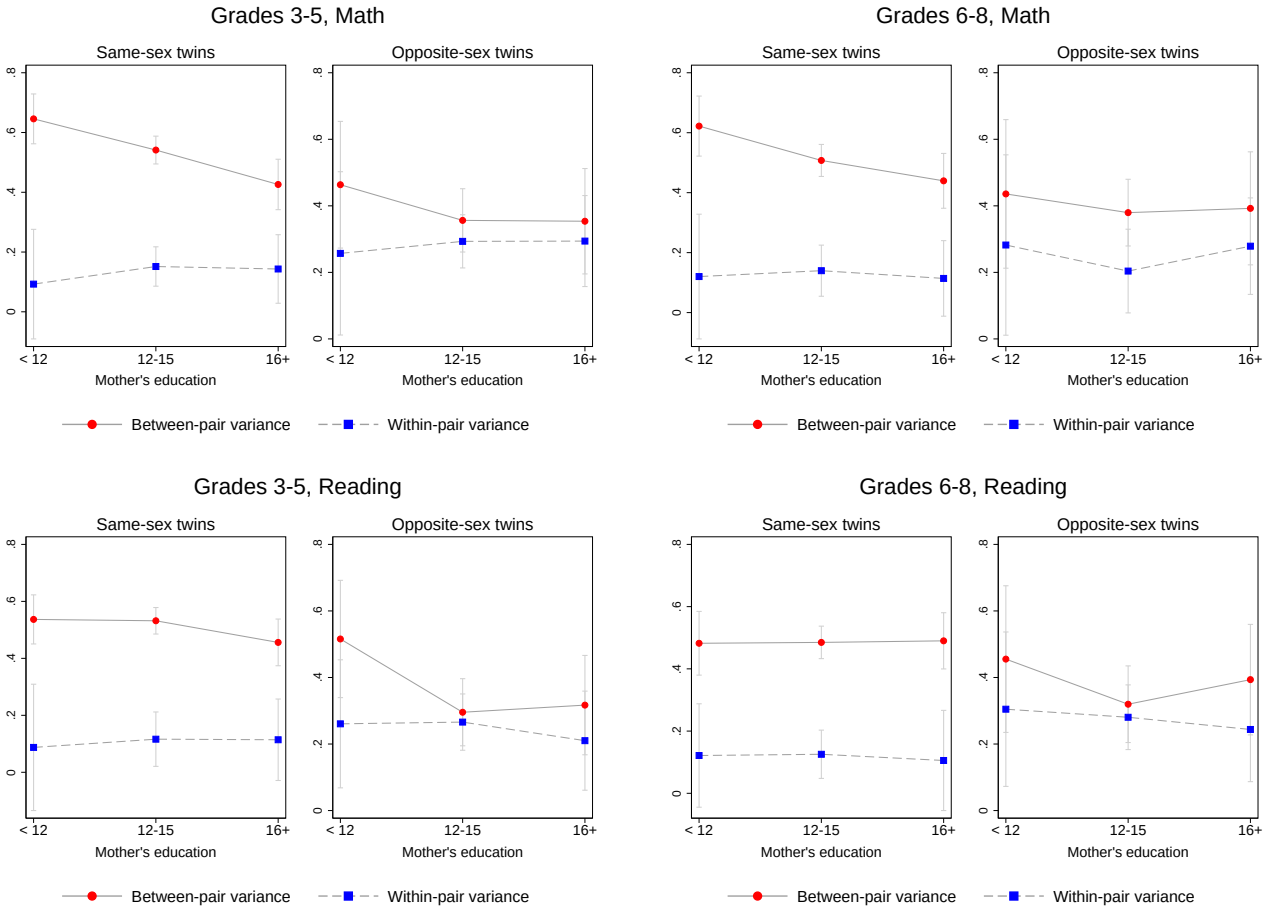
Note: The left-hand side figures present between- and within-pair variance among same-sex and opposite-sex twins in grades 3 to 5 mathematics (top) and reading (bottom) FCAT test scores. The right-hand side figures present identical results for grades 6 to 8. Socioeconomic status is measured based on maternal years of education. Sample of white mothers. For estimation details see Figure 3.

Figure S15: Intraclass correlation for same-sex and opposite-sex twin and non-twin sibling pairs. White mothers.



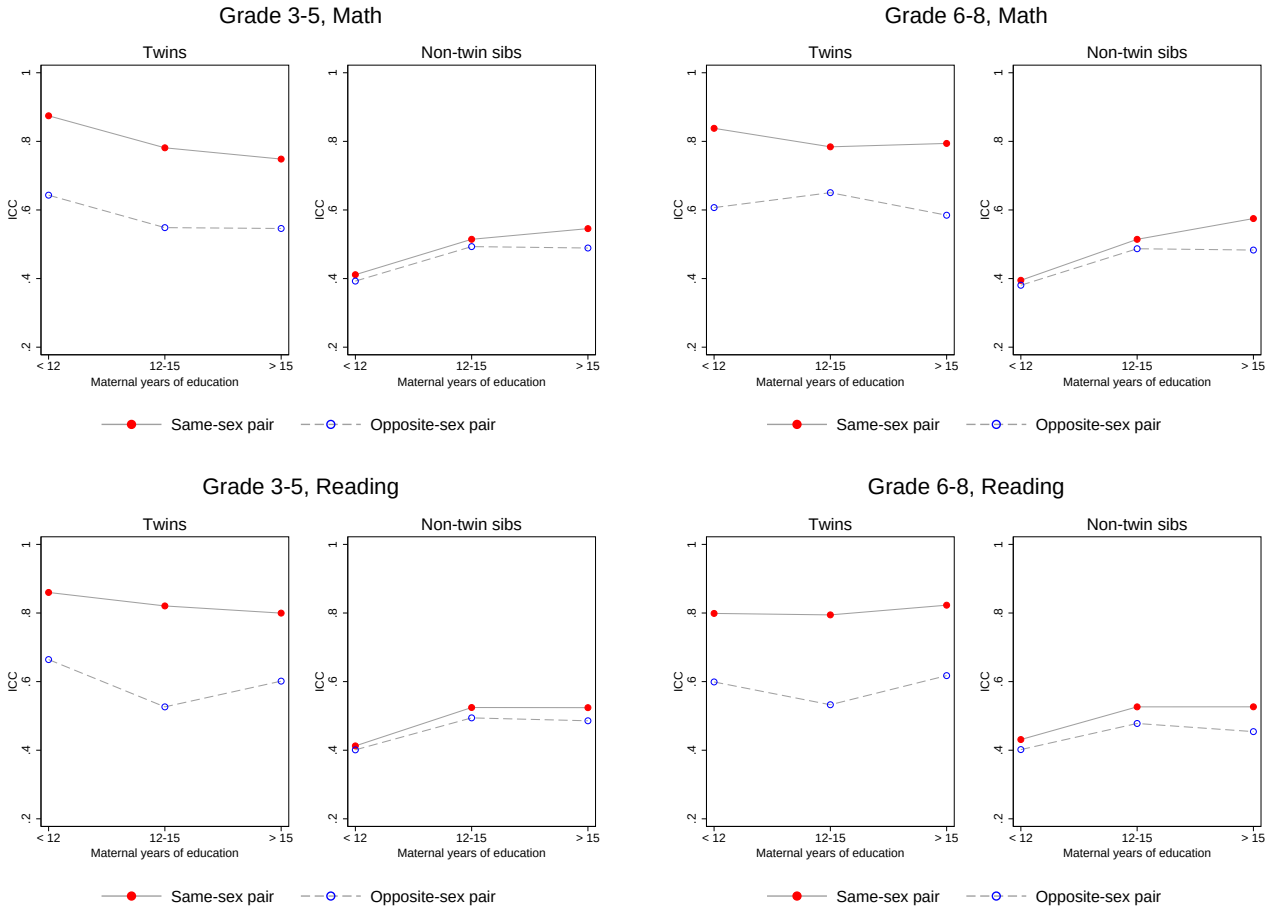
Note: The left-hand side figures present intraclass correlation coefficients among same-sex and opposite-sex pairs of twins and closely spaced siblings in grades 3 to 5 mathematics (top) and reading (bottom) FCAT test scores. The right-hand side figures present identical results for grades 6 to 8. Socioeconomic status is measured based on maternal years of education. Sample of white mothers. For estimation details see Figure 4.

Figure S16: Between- and within-pair variance in achievement test scores for same-sex and opposite-sex twins. Mothers up to age 30.



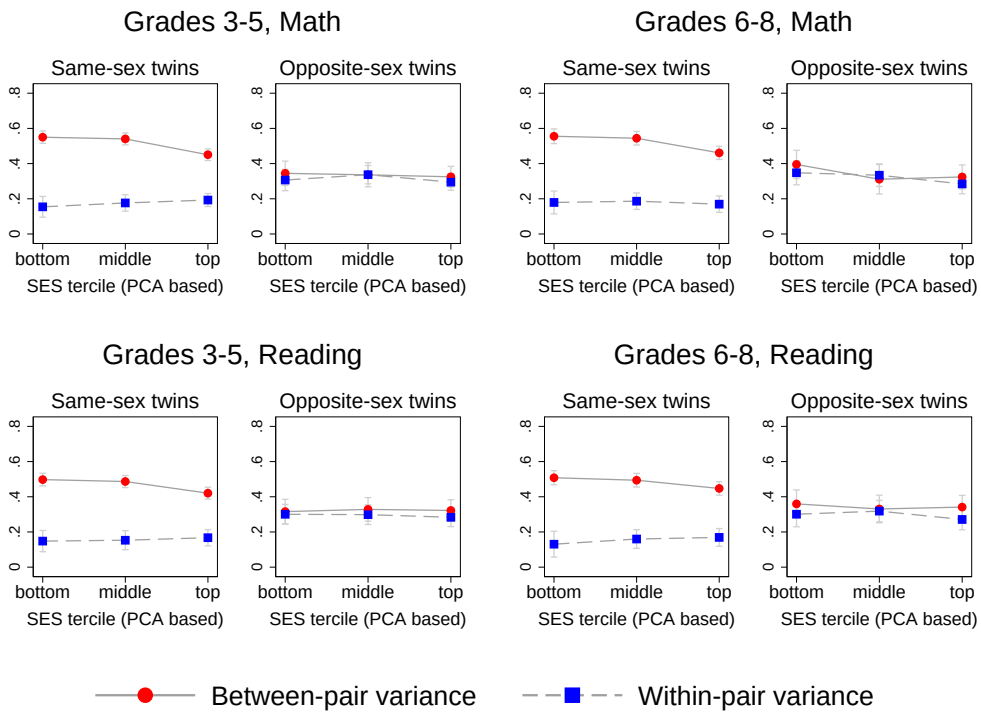
Note: The left-hand side figures present between- and within-pair variance among same-sex and opposite-sex twins in grades 3 to 5 mathematics (top) and reading (bottom) FCAT test scores. The right-hand side figures present identical results for grades 6 to 8. Socioeconomic status is measured based on maternal years of education. Sample of mothers up to the age of 30. For estimation details see Figure 3.

Figure S17: Intraclass correlation for same-sex and opposite-sex twin and non-twin sibling pairs. Mothers up to age 30.



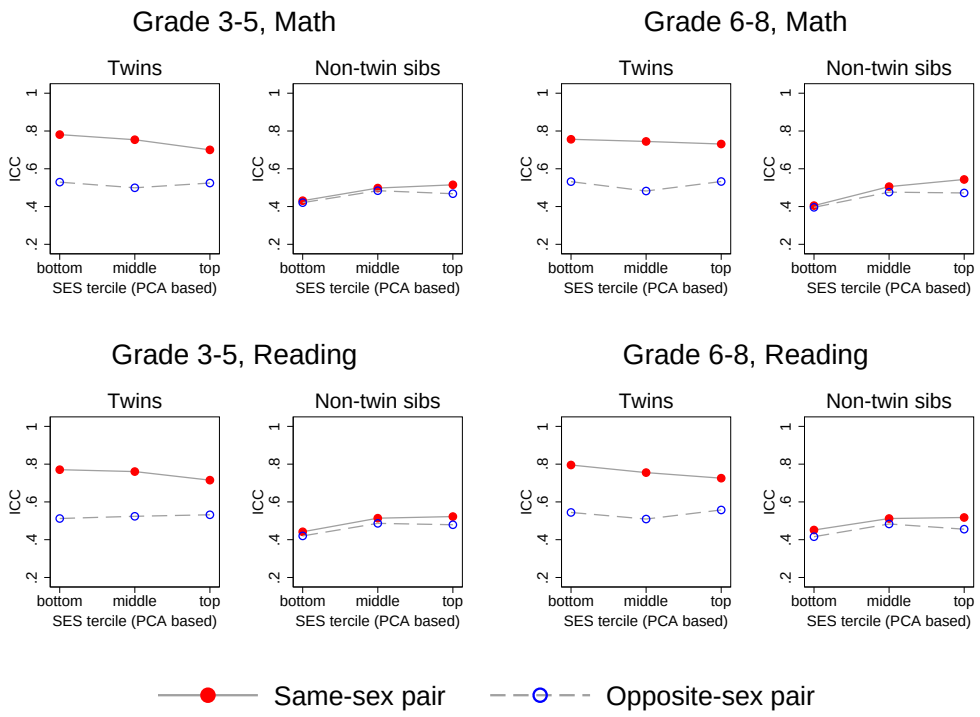
Note: The left-hand side figures present intraclass correlation coefficients among same-sex and opposite-sex pairs of twins and closely spaced siblings in grades 3 to 5 mathematics (top) and reading (bottom) FCAT test scores. The right-hand side figures present identical results for grades 6 to 8. Socioeconomic status is measured based on maternal years of education. Sample of mothers up to age of 30. For estimation details see Figure 4.

Figure S18: Between- and within-pair variance in achievement test scores for same-sex and opposite-sex twins. SES terciles based on PCA (excluding zip code income).



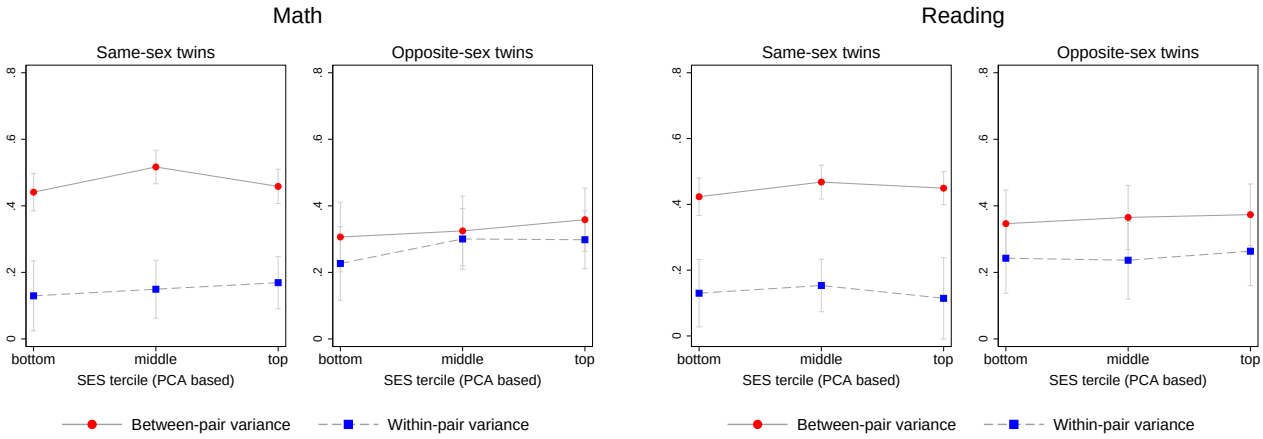
Note: The left-hand side figures present between- and within-pair variance among same-sex and opposite-sex twins in grades 3 to 5 mathematics (top) and reading (bottom) FCAT test scores. The right-hand side figures present identical results for grades 6 to 8. Socioeconomic status is measured based on index constructed using PCA where we include maternal years of education, medicaid paid birth, parents married, father present and father absent. For estimation details see Figure 3.

Figure S19: Intraclass correlation for same-sex and opposite-sex twin and non-twin sibling pairs. SES terciles based on PCA (excluding zip code income).



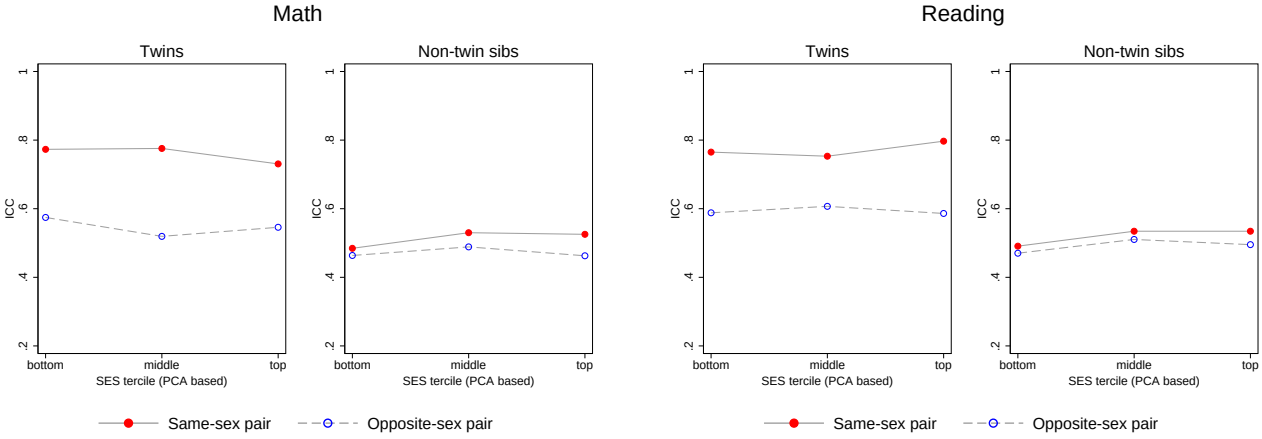
Note: The left-hand side figures present intraclass correlation coefficients among same-sex and opposite-sex pairs of twins and closely spaced siblings in grades 3 to 5 mathematics (top) and reading (bottom) FCAT test scores. The right-hand side figures present identical results for grades 6 to 8. Socioeconomic status is measured based on index constructed using PCA where we include maternal years of education, medicaid paid birth, parents married, father present and father absent. For estimation details see Figure 4.

Figure S20: Between- and within-pair variance in Stanford achievement test for same-sex and opposite sex twins. SES terciles based on PCA (excluding zip code income).



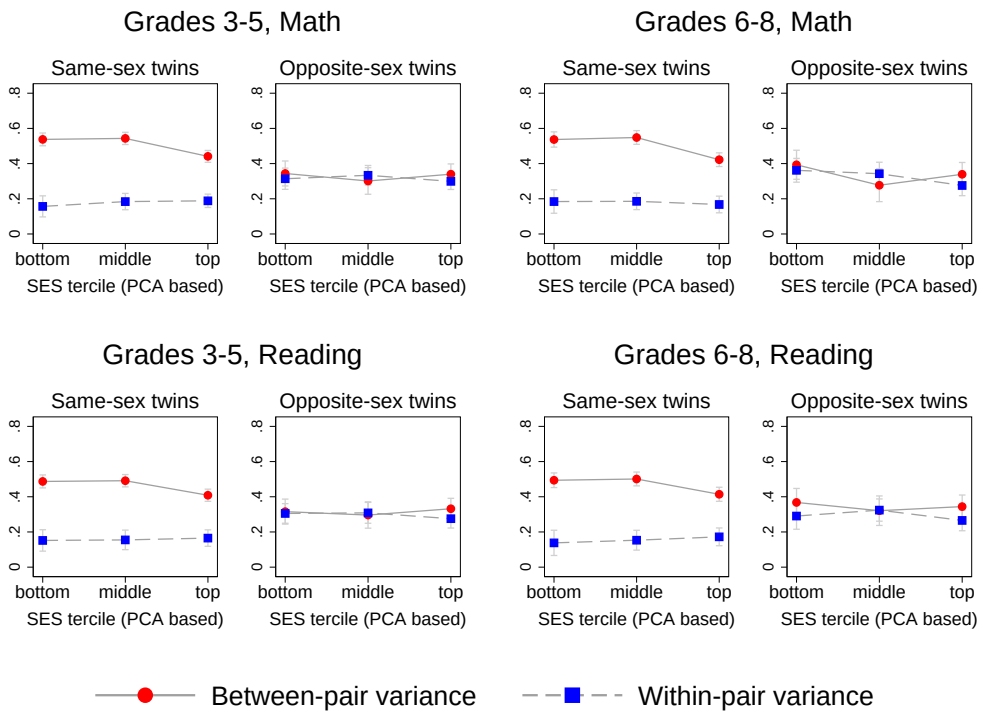
Notes: The left-hand side figures present between- and within-pair variance among same-sex and opposite-sex twins in grades 3 to 5 Stanford mathematics achievement test. The right-hand side figures present identical results for reading test. Socioeconomic status is measured based on index constructed using PCA where we include maternal years of education, medicaid paid birth, parents married, father present and father absent. For estimation details see Figure 3.

Figure S21: Intraclass correlations for same-sex and opposite-sex twin and non-twin sibling pairs on Stanford achievement test. SES terciles based on PCA (excluding zip code income).



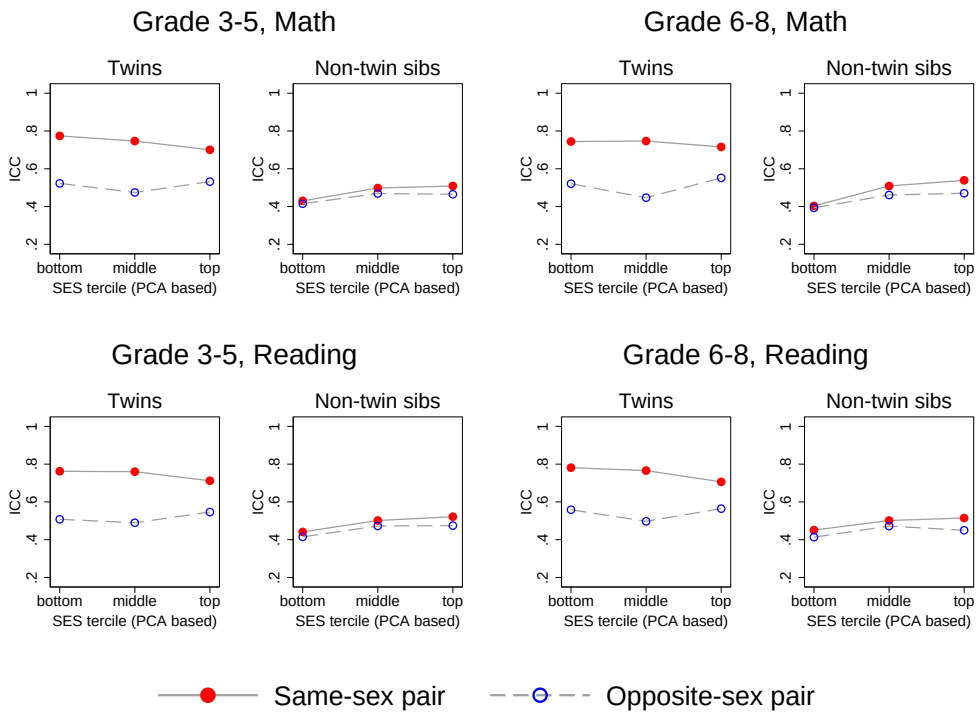
Note: The left-hand side figures present intraclass correlation coefficients among same-sex and opposite-sex pairs of twins and closely spaced siblings in grades 3 to 5 Stanford achievement test. The right-hand side figures present identical results for reading test. Socioeconomic status is measured based on index constructed using PCA where we include maternal years of education, medicaid paid birth, parents married, father present and father absent. For estimation details see Figure 4.

Figure S22: Between- and within-pair variance in achievement test scores for same-sex and opposite-sex twins. SES terciles based on PCA (including zip code income).



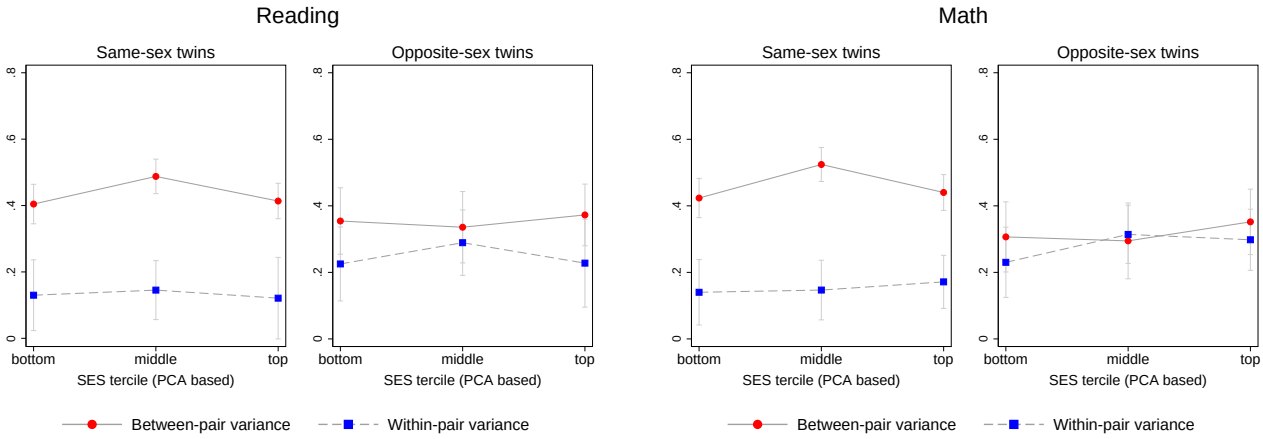
Note: The left-hand side figures present between- and within-pair variance among same-sex and opposite-sex twins in grades 3 to 5 mathematics (top) and reading (bottom) FCAT test scores. The right-hand side figures present identical results for grades 6 to 8. Socioeconomic status is measured based on index constructed using PCA where we include maternal years of education, medicaid paid birth, parents married, father present, father absent and median zip code income of residence at the time of child birth. For estimation details see Figure 3.

Figure S23: Intraclass correlation for same-sex and opposite-sex twin and non-twin sibling pairs. SES terciles based on PCA (including zip code income).



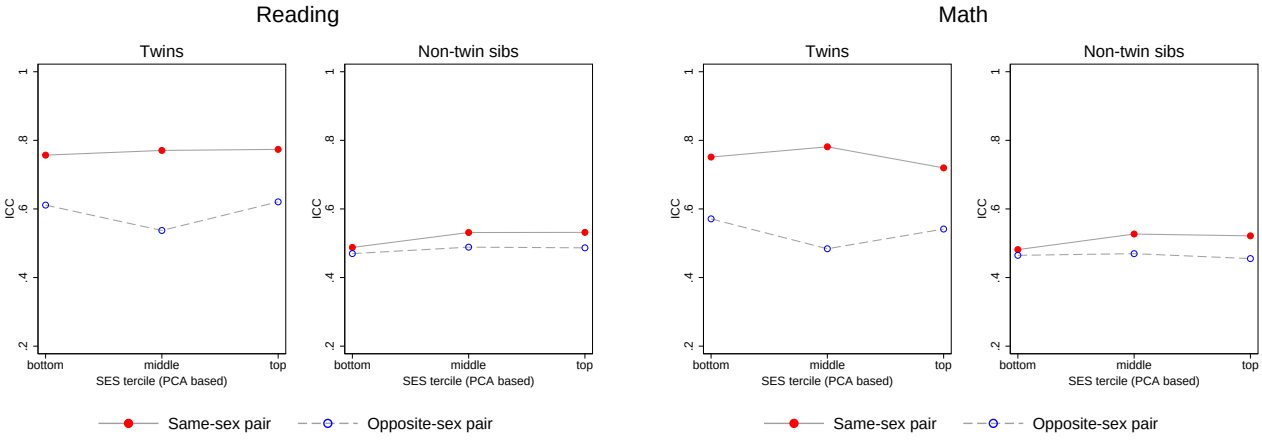
Note: The left-hand side figures present intraclass correlation coefficients among same-sex and opposite-sex pairs of twins and closely spaced siblings in grades 3 to 5 mathematics (top) and reading (bottom) FCAT test scores. The right-hand side figures present identical results for grades 6 to 8. Socioeconomic status is measured based on index constructed using PCA where we include maternal years of education, medicaid paid birth, parents married, father present, father absent and median zip code income of residence at the time of child birth. For estimation details see Figure 4.

Figure S24: Between- and within-pair variance in Stanford achievement test for same-sex and opposite sex twins. SES terciles based on PCA (including zip code income).



Notes: The left-hand side figures present between- and within-pair variance among same-sex and opposite-sex twins in grades 3 to 5 Stanford mathematics achievement test. The right-hand side figures present identical results for reading test. Socioeconomic status is measured based on index constructed using PCA where we include maternal years of education, medicaid paid birth, parents married, father present, father absent and median zip code income of residence at the time of child birth. For estimation details see Figure 3.

Figure S25: Intraclass correlations for same-sex and opposite-sex twin and non-twin sibling pairs on Stanford achievement test. SES terciles based on PCA (including zip code income).



Note: The left-hand side figures present intraclass correlation coefficients among same-sex and opposite-sex pairs of twins and closely spaced siblings in grades 3 to 5 Stanford achievement test. The right-hand side figures present identical results for reading test. Socioeconomic status is measured based on index constructed using PCA where we include maternal years of education, medicaid paid birth, parents married, father present, father absent and median zip code income of residence at the time of child birth. For estimation details see Figure 4.