

ESTIMATING A THEORETICALLY CONSISTENT
HUMAN CAPITAL PRODUCTION FUNCTION WITH
AN APPLICATION TO HEAD START

ONLINE APPENDIX

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WORKING PAPER 31199

Table A1. Estimates of the Effect of Head Start and Preschool on PIAT Scores by Age
 Estimates from Family Fixed Effects Model

	(1) Math	(2) Math	(3) Reading Recognition	(4) Reading Recognition	(5) Reading Comprehensi on	(6) Reading Comprehensi on
Head Start						
Ages 5-6	1.52** (0.46)	0.75 (0.45)	1.93** (0.52)	1.09* (0.51)	1.71** (0.47)	0.71 (0.45)
Ages 7-8	-0.45 (0.59)	-0.19 (0.59)	0.088 (0.58)	0.19 (0.59)	0.068 (0.49)	0.19 (0.51)
Ages 9-10	0.11 (0.58)	0.35 (0.59)	-0.71 (0.64)	-0.39 (0.64)	-0.98 (0.53)	-0.57 (0.55)
Ages 11-12	-0.90 (0.62)	-0.45 (0.63)	-1.75* (0.69)	-1.00 (0.70)	-1.68** (0.56)	-0.89 (0.56)
Preschool						
Ages 5-6	-1.41** (0.39)	-0.29 (0.36)	-2.10** (0.46)	-0.70 (0.45)	-1.89** (0.40)	-0.52 (0.38)
Ages 7-8	-0.55 (0.43)	-0.58 (0.43)	-0.93 (0.52)	-0.51 (0.53)	-0.51 (0.45)	-0.19 (0.46)
Ages 9-10	0.10 (0.47)	-0.40 (0.49)	-0.17 (0.59)	-0.92 (0.60)	-0.0066 (0.51)	-0.57 (0.53)
Ages 11-12	-0.095 (0.50)	-0.58 (0.50)	0.096 (0.63)	-0.78 (0.63)	0.45 (0.51)	-0.41 (0.51)
Female	-0.29 (0.21)	-0.28 (0.21)	1.48** (0.27)	1.47** (0.27)	1.17** (0.22)	1.16** (0.22)
Children's age in months	0.97** (0.044)	0.90** (0.070)	0.99** (0.050)	0.93** (0.080)	0.96** (0.046)	0.86** (0.073)
Children's age in months squared	-0.0024** (0.00020)	-0.0021** (0.00034)	-0.0022** (0.00023)	-0.0022** (0.00040)	-0.0025** (0.00021)	-0.0022** (0.00036)
Birthweight						
90 to 104 oz	-0.069 (0.56)	-0.12 (0.55)	-0.20 (0.71)	-0.19 (0.70)	-0.19 (0.59)	-0.17 (0.59)
105 to 129 oz	1.00 (0.54)	0.99 (0.53)	0.88 (0.69)	0.94 (0.65)	0.46 (0.55)	0.51 (0.55)
130 oz and More	1.03 (0.59)	1.03 (0.58)	0.78 (0.70)	0.81 (0.68)	0.35 (0.59)	0.41 (0.59)
Missing	1.32* (0.65)	1.33* (0.64)	0.94 (0.79)	0.97 (0.77)	0.58 (0.62)	0.64 (0.62)
Mother's Marital Status						
Married	-0.010	0.65	0.16	1.02	-0.78	0.091

	(0.67)	(0.66)	(1.06)	(1.05)	(0.79)	(0.77)
Separated/Divorced	-0.58	0.062	-0.88	-0.063	-1.79*	-0.89
	(0.68)	(0.68)	(1.18)	(1.17)	(0.83)	(0.82)
Missing	-1.94	-5.28	-1.66	4.27	-4.07**	3.79
	(1.85)	(3.54)	(2.56)	(2.51)	(1.48)	(2.18)
Mother employed	-0.26	-0.25	-0.16	-0.18	-0.18	-0.21
	(0.22)	(0.22)	(0.24)	(0.24)	(0.22)	(0.22)
Missing maternal employment	0.28	0.37	-0.077	0.0056	-0.59	-0.63
	(0.61)	(0.61)	(0.88)	(0.84)	(0.62)	(0.61)
Average Family Income						
Between 10,001 and 25,000	-0.54	-0.52	0.38	0.43	0.56	0.60
	(0.39)	(0.39)	(0.54)	(0.52)	(0.45)	(0.44)
Between 25,001 and 50,000	0.15	0.15	0.74	0.71	0.93	0.90
	(0.52)	(0.52)	(0.75)	(0.71)	(0.61)	(0.60)
More than 50,000	0.11	-0.061	-0.030	-0.30	-0.020	-0.24
	(0.73)	(0.73)	(1.06)	(1.05)	(0.96)	(0.99)
Missing	0.44	0.25	0.60	0.15	0.72	0.42
	(0.70)	(0.71)	(0.82)	(0.84)	(0.77)	(0.79)
Mother's Age at Birth						
19-23	0.19	-0.066	-0.068	-0.42	-0.53	-0.90
	(0.46)	(0.47)	(0.65)	(0.66)	(0.54)	(0.55)
24-30	-0.071	-0.37	0.19	-0.25	-0.98	-1.49
	(0.74)	(0.74)	(0.98)	(0.99)	(0.81)	(0.82)
31-35	-0.77	-0.88	0.89	0.60	-0.77	-1.01
	(1.05)	(1.04)	(1.44)	(1.43)	(1.16)	(1.15)
Over 35	-1.40	-1.28	1.56	1.45	0.13	0.21
	(1.51)	(1.49)	(1.93)	(1.91)	(1.56)	(1.53)
Mother's Education						
High School * Age 5		-0.95		-0.59		-0.82
		(0.95)		(0.95)		(0.82)
High School * Age 6		-1.88*		-0.67		-1.20
		(0.92)		(0.99)		(0.80)
High School * Age 7		-0.38		-0.35		-0.18
		(0.94)		(0.88)		(0.84)
High School * Age 8		1.67		0.35		-0.31
		(0.95)		(0.98)		(0.84)
High School * Age 9		-0.010		0.24		1.34
		(0.95)		(0.98)		(0.87)
High School * Age 10		-0.29		0.83		-0.070
		(0.97)		(0.99)		(0.82)
High School * Age 11		-0.072		-0.18		0.17

High School * Age 12	(0.92) -0.24 (0.96)	(1.09) 0.12 (1.16)	(0.96) -0.36 (0.94)
Some College * Age 5	-1.00 (1.27)	-1.59 (1.39)	-1.39 (1.19)
Some College * Age 6	-1.56 (1.13)	-2.38 (1.40)	-1.17 (1.11)
Some College * Age 7	-1.00 (1.27)	-2.31 (1.30)	-1.06 (1.17)
Some College * Age 8	1.62 (1.22)	-0.57 (1.34)	-0.41 (1.16)
Some College * Age 9	0.82 (1.26)	0.28 (1.35)	0.71 (1.18)
Some College * Age 10	-0.11 (1.17)	0.19 (1.32)	-0.0094 (1.19)
Some College * Age 11	0.29 (1.20)	-0.37 (1.46)	0.82 (1.26)
Some College * Age 12	-0.55 (1.16)	0.21 (1.50)	-0.55 (1.29)
Bachelor's Degree * Age 5	-2.43 (1.57)	1.24 (1.99)	-0.071 (1.61)
Bachelor's Degree * Age 6	-0.99 (1.62)	-0.31 (2.24)	-1.41 (1.70)
Bachelor's Degree * Age 7	0.096 (1.58)	0.72 (1.95)	-0.30 (1.61)
Bachelor's Degree * Age 8	3.17 (1.72)	1.31 (2.24)	0.66 (1.82)
Bachelor's Degree * Age 9	0.10 (1.55)	1.97 (2.01)	2.29 (1.63)
Bachelor's Degree * Age 10	0.081 (1.61)	2.82 (2.42)	1.50 (1.72)
Bachelor's Degree * Age 11	0.22 (1.64)	2.16 (2.00)	0.76 (1.70)
Bachelor's Degree * Age 12	-0.12 (1.58)	0.89 (2.23)	1.17 (1.86)
Missing * Age 5	-0.80 (1.97)	-8.16** (1.94)	-6.74** (1.25)
Missing * Age 6	5.23 (4.14)	1.12 (4.44)	-3.78* (1.84)
Missing * Age 7	-3.27** (0.98)	2.73** (0.87)	4.94** (0.82)
Missing * Age 8	8.62	1.16	-0.10

	(5.56)	(4.19)	(2.60)
Missing * Age 9	-4.56	-10.0**	-5.11
	(5.49)	(3.50)	(3.00)
Missing * Age 10	5.64	-5.24*	-5.27*
	(4.16)	(2.51)	(2.34)
Missing * Age 11	6.52	-2.81	-11.7**
	(4.37)	(3.24)	(4.12)
Missing * Age 12	2.36	-6.45	-6.93
	(5.71)	(6.23)	(4.09)
Magazines in mom's household at age 14			
* Age 5	-2.07*	-2.38*	-2.92**
	(0.92)	(1.18)	(0.91)
* Age 6	-1.15	-1.58	-0.75
	(0.79)	(1.04)	(0.81)
* Age 7	-0.48	-2.23*	-1.79
	(0.80)	(1.13)	(0.94)
* Age 8	-0.28	-1.34	0.29
	(0.69)	(0.82)	(0.75)
* Age 9	-0.43	-0.74	-0.61
	(0.82)	(1.07)	(0.89)
* Age 10	0.33	-0.41	-0.012
	(0.71)	(0.80)	(0.85)
* Age 11	0.15	1.00	0.091
	(0.82)	(1.15)	(0.91)
Missing Magazines at age 14			
* Age 5	-2.42	2.00	1.45
	(6.10)	(9.07)	(7.16)
* Age 6	3.65	1.97	-0.68
	(2.01)	(5.03)	(3.28)
* Age 7	-0.48	5.12	4.68
	(2.27)	(5.02)	(2.86)
* Age 8	6.25*	-0.62	0.74
	(2.63)	(3.99)	(3.79)
* Age 9	0.76	2.24	2.95
	(1.57)	(3.15)	(2.28)
* Age 10	0.88	-2.47	-1.83
	(2.39)	(4.77)	(2.78)
* Age 11	-2.83	-0.89	-3.24
	(1.68)	(3.44)	(3.05)
Rosenberg Quartile			
2 nd Quartile * Age 5	0.39	-2.23*	-2.01*
	(0.87)	(1.10)	(0.89)

2 nd Quartile * Age 6	0.64 (0.75)	-0.73 (0.94)	-0.71 (0.74)
2 nd Quartile * Age 7	1.01 (0.79)	-1.87 (0.99)	-0.67 (0.90)
2 nd Quartile * Age 8	1.97** (0.63)	0.18 (0.78)	-0.32 (0.70)
2 nd Quartile * Age 9	1.23 (0.81)	-0.67 (1.01)	-0.75 (0.92)
2 nd Quartile * Age 10	0.64 (0.69)	-0.26 (0.69)	-0.99 (0.73)
2 nd Quartile * Age 11	1.24 (0.87)	-0.69 (1.00)	-1.10 (0.88)
3 rd Quartile * Age 5	-0.54 (0.97)	-2.96* (1.17)	-1.24 (1.02)
3 rd Quartile * Age 6	0.53 (0.80)	-1.76 (0.98)	-0.79 (0.87)
3 rd Quartile * Age 7	0.24 (0.94)	-2.27* (1.10)	-0.43 (1.02)
3 rd Quartile * Age 8	1.30 (0.78)	-0.89 (0.85)	-0.60 (0.80)
3 rd Quartile * Age 9	-0.10 (0.96)	-1.93 (1.10)	-1.59 (0.99)
3 rd Quartile * Age 10	1.06 (0.65)	-0.18 (0.79)	-0.79 (0.71)
3 rd Quartile * Age 11	-0.31 (0.90)	-1.78 (1.14)	-1.57 (1.06)
4 th Quartile * Age 5	-0.19 (0.90)	-1.50 (1.06)	-0.71 (1.00)
4 th Quartile * Age 6	-0.35 (0.81)	-1.43 (0.95)	-0.61 (0.78)
4 th Quartile * Age 7	-0.19 (0.88)	-1.52 (0.98)	0.046 (1.01)
4 th Quartile * Age 8	-0.12 (0.75)	0.14 (0.74)	-0.57 (0.88)
4 th Quartile * Age 9	0.65 (0.84)	-0.49 (1.01)	-0.68 (0.94)
4 th Quartile * Age 10	-0.19 (0.60)	-0.13 (0.66)	0.25 (0.74)
4 th Quartile * Age 11	1.60 (0.92)	-0.24 (1.04)	-0.98 (0.97)
Missing * Age 5	-5.96* (2.38)	-6.26 (3.52)	-8.79** (3.37)

Missing * Age 6	-1.67 (1.57)	-2.63 (3.90)	-3.67 (2.75)
Missing * Age 7	-4.76 (2.49)	-6.68* (3.13)	-7.17* (3.37)
Missing * Age 8	1.64 (1.13)	-2.28 (2.65)	-2.05 (2.38)
Missing * Age 9	-5.42* (2.33)	-6.85 (5.19)	-9.48* (3.81)
Missing * Age 10	1.15 (1.22)	-2.16 (1.95)	-1.16 (1.80)
Missing * Age 11	-5.44* (2.32)	-9.89* (4.97)	-13.3** (5.03)
AFQT Quartile			
2 nd Quartile * Age 5	-3.32** (0.88)	-5.23** (1.12)	-4.42** (0.95)
2 nd Quartile * Age 6	-1.57* (0.77)	-4.18** (0.99)	-3.60** (0.81)
2 nd Quartile * Age 7	-2.07* (0.81)	-3.45** (0.96)	-3.04** (0.90)
2 nd Quartile * Age 8	-0.64 (0.69)	-1.74* (0.86)	-1.56* (0.79)
2 nd Quartile * Age 9	-0.76 (0.82)	-2.14* (0.92)	-2.66** (0.89)
2 nd Quartile * Age 10	-0.43 (0.64)	-0.94 (0.67)	-0.25 (0.74)
2 nd Quartile * Age 11	-0.72 (0.83)	-1.53 (1.01)	-1.34 (0.99)
3 rd Quartile * Age 5	-6.21** (1.01)	-8.65** (1.40)	-6.35** (1.11)
3 rd Quartile * Age 6	-4.38** (0.87)	-7.07** (1.15)	-6.87** (0.96)
3 rd Quartile * Age 7	-1.85 (1.02)	-5.18** (1.21)	-3.54** (1.16)
3 rd Quartile * Age 8	-1.79* (0.83)	-3.78** (1.03)	-2.76* (1.15)
3 rd Quartile * Age 9	-1.39 (1.00)	-2.97** (1.15)	-2.40* (1.09)
3 rd Quartile * Age 10	-1.10 (0.70)	-3.01** (0.79)	-2.86** (1.07)
3 rd Quartile * Age 11	-1.31 (1.06)	-1.56 (1.34)	0.73 (1.17)
4 th Quartile * Age 5	-5.58**	-7.95**	-7.25**

4 th Quartile * Age 6	(1.26) -4.38** (1.05)	(1.45) -6.24** (1.38)	(1.32) -7.03** (1.17)
4 th Quartile * Age 7	(1.19) -1.77 (1.12)	(1.31) -3.51** (1.09)	(1.26) -3.17* (1.17)
4 th Quartile * Age 8	(1.12) -1.62 (1.12)	(1.31) -2.60* (1.09)	(1.26) -3.38** (1.17)
4 th Quartile * Age 9	(1.22) -0.32 (1.22)	(1.34) -1.77 (1.34)	(1.27) -1.56 (1.27)
4 th Quartile * Age 10	(0.87) -0.31 (0.87)	(0.92) -0.49 (0.92)	(1.15) -1.83 (1.15)
4 th Quartile * Age 11	(1.30) -0.53 (1.30)	(1.38) -0.78 (1.38)	(1.30) 0.13 (1.30)
Missing * Age 5	(1.70) 4.05* (1.70)	(2.79) 3.44 (2.79)	(3.06) 4.01 (3.06)
Missing * Age 6	(1.80) 0.66 (1.80)	(3.23) -2.42 (3.23)	(2.87) -2.04 (2.87)
Missing * Age 7	(1.91) 3.74 (1.91)	(2.53) 4.15 (2.53)	(2.87) 2.78 (2.87)
Missing * Age 8	(1.25) -0.079 (1.25)	(1.68) -2.37 (1.68)	(1.92) -0.55 (1.92)
Missing * Age 9	(1.85) 2.93 (1.85)	(3.19) 3.90 (3.19)	(3.25) 5.61 (3.25)
Missing * Age 10	(0.96) 0.17 (0.96)	(1.53) -1.53 (1.53)	(1.60) -3.76* (1.60)
Missing * Age 11	(1.80) 2.91 (1.80)	(2.92) 3.37 (2.92)	(3.78) 7.16 (3.78)
Rotter Quartile			
2 nd Quartile * Age 5	(0.95) 1.42 (0.95)	(1.20) 0.73 (1.20)	(1.06) 0.97 (1.06)
2 nd Quartile * Age 6	(0.87) -0.87 (0.87)	(1.00) -0.79 (1.00)	(0.94) 0.25 (0.94)
2 nd Quartile * Age 7	(0.90) -0.22 (0.90)	(1.15) -0.72 (1.15)	(1.07) -0.92 (1.07)
2 nd Quartile * Age 8	(0.80) -0.37 (0.80)	(0.87) -0.40 (0.87)	(0.92) -0.029 (0.92)
2 nd Quartile * Age 9	(0.89) -0.61 (0.89)	(1.20) -1.77 (1.20)	(1.01) -0.85 (1.01)
2 nd Quartile * Age 10	(0.71) -0.11 (0.71)	(0.75) -1.38 (0.75)	(0.84) 0.34 (0.84)
2 nd Quartile * Age 11	(0.92) -0.68 (0.92)	(1.30) -1.82 (1.30)	(1.00) -1.13 (1.00)

3 rd Quartile * Age 5	1.07 (0.94)	0.98 (1.04)	1.21 (1.03)
3 rd Quartile * Age 6	-0.99 (0.89)	-0.43 (0.96)	-0.41 (0.89)
3 rd Quartile * Age 7	-0.56 (0.89)	-0.014 (1.00)	0.10 (1.04)
3 rd Quartile * Age 8	0.031 (0.80)	-0.064 (0.82)	0.27 (0.92)
3 rd Quartile * Age 9	-0.21 (0.91)	-0.34 (0.98)	-0.24 (0.99)
3 rd Quartile * Age 10	0.23 (0.70)	-0.98 (0.66)	0.47 (0.79)
3 rd Quartile * Age 11	-0.81 (0.94)	0.49 (0.98)	-0.60 (1.05)
4 th Quartile * Age 5	1.35 (1.04)	0.52 (1.29)	1.47 (1.17)
4 th Quartile * Age 6	-1.16 (0.87)	-1.06 (1.05)	-0.22 (0.92)
4 th Quartile * Age 7	-0.13 (0.94)	-0.12 (1.12)	0.14 (1.12)
4 th Quartile * Age 8	0.0091 (0.78)	-1.27 (0.87)	-0.20 (0.90)
4 th Quartile * Age 9	0.16 (0.93)	-1.25 (1.08)	0.19 (1.09)
4 th Quartile * Age 10	-0.0059 (0.72)	-1.51 (0.79)	-0.10 (0.83)
4 th Quartile * Age 11	0.76 (0.93)	-0.53 (1.13)	0.51 (1.04)
Missing * Age 5	-1.26 (1.54)	3.86 (3.49)	1.38 (2.83)
Missing * Age 6	-2.13 (1.41)	0.41 (4.33)	-0.53 (2.40)
Missing * Age 7	0.34 (1.39)	5.39* (2.60)	3.39* (1.59)
Missing * Age 8	-3.56 (2.54)	-1.24 (2.30)	-2.93* (1.41)
Missing * Age 9	-1.43 (1.42)	3.74 (2.71)	1.40 (1.73)
Missing * Age 10	-2.16 (1.17)	-3.14 (1.76)	0.14 (1.37)
Missing * Age 11	0.73 (1.70)	8.75* (3.85)	2.97 (2.93)

Mom's marriage date			
Before first birth * Age 5	0.011 (0.73)	-1.38 (0.91)	-1.21 (0.77)
Before first birth * Age 6	-1.21 (0.68)	-1.66 (0.87)	-2.24** (0.68)
Before first birth * Age 7	0.47 (0.68)	-0.40 (0.84)	-0.37 (0.74)
Before first birth * Age 8	-0.92 (0.60)	-1.31 (0.72)	-0.60 (0.66)
Before first birth * Age 9	1.09 (0.68)	-0.085 (0.81)	0.091 (0.76)
Before first birth * Age 10	-0.33 (0.61)	-1.17 (0.61)	-0.17 (0.65)
Before first birth * Age 11	0.78 (0.70)	0.30 (0.85)	0.64 (0.77)
Within one year after first birth * Age 5	-1.00 (1.45)	-2.73 (2.06)	-1.99 (1.65)
Within one year after first birth * Age 6	-0.40 (1.12)	-0.84 (1.60)	-1.86 (1.35)
Within one year after first birth * Age 7	0.67 (1.31)	-0.72 (1.73)	-0.75 (1.59)
Within one year after first birth * Age 8	-1.93* (0.86)	-1.18 (1.15)	-0.83 (1.24)
Within one year after first birth * Age 9	-0.64 (1.36)	-3.08* (1.47)	-1.51 (1.43)
Within one year after first birth * Age 10	-1.41 (0.99)	-1.85 (1.15)	-0.90 (0.97)
Within one year after first birth * Age 11	-0.089 (1.19)	-0.89 (1.60)	0.44 (1.54)
Missing * Age 5	-1.20 (1.76)	1.37 (2.34)	1.47 (2.48)
Missing * Age 6	-3.15* (1.40)	-0.94 (1.72)	-1.34 (1.91)
Missing * Age 7	-1.55 (1.87)	1.73 (2.19)	0.91 (2.67)
Missing * Age 8	-3.26 (1.76)	-2.60 (1.44)	-1.26 (2.11)
Missing * Age 9	-2.85 (1.93)	-1.26 (1.83)	-2.48 (2.38)
Missing * Age 10	-1.46 (1.36)	-2.51* (1.15)	-0.17 (1.95)
Missing * Age 11	-4.53	-2.63	-1.62

		(2.35)		(1.94)		(2.94)
Observations	20395	20395	20289	20289	19881	19881

Notes: Standard errors in parentheses clustered at the mother level. Average family income in real dollars. All regressions include year dummies and a dummy for each age group. * $p < 0.05$, ** $p < 0.01$

Table A2. Estimates of the Effect of Head Start and Preschool on PPVT Score by Age from Unrestricted First Difference Model.

	Ages 4-5
Head Start (Sib. 1)	-0.47 (1.50)
Preschool (Sib. 1)	-1.99 (1.25)
Head Start (Sib. 2)	0.89 (1.53)
Preschool (Sib. 2)	0.84 (1.32)
Sibling 1 age in months	-0.14 (1.41)
Sibling 2 age in months	-1.76 (1.38)
Sibling 1 age in months squared	0.011 (0.012)
Sibling 2 age in months squared	0.0056 (0.012)
Female (Sib. 1)	1.78 (1.03)
Female (Sib. 2)	-3.20** (0.99)
Birthweight (Sib. 1)	
90 to 104 oz	0.53 (2.13)
105 to 129 oz	-0.68 (1.80)
130 oz and More	-0.60 (2.01)
Missing	-1.76 (2.74)
Birthweight (Sib. 2)	
90 to 104 oz	-1.86 (2.08)
105 to 129 oz	-1.88 (1.81)
130 oz and More	0.30 (1.99)
Missing	0.63 (2.07)
Mother's Age at Birth (Sib. 1)	
19-23	-2.82 (2.31)
24-30	-1.16 (3.02)
31-35	2.05 (4.31)
Over 35	-8.86 (7.02)
Mother's Age at Birth (Sib. 2)	
19-23	-28.3** (4.29)

24-30	-29.3** (4.56)
31-35	-29.5** (5.05)
Over 35	-30.4** (5.83)
Mother's marital status (Sib. 1)	
Married	0.18 (2.46)
Separated/Divorced	0.055 (2.76)
Mother's marital status (Sib. 2)	
Married	-0.37 (2.46)
Separated/Divorced	1.63 (2.63)
Missing	24.0** (8.53)
Mother employed (Sib. 1)	0.45 (1.18)
Missing maternal employment (Sib. 1)	2.38 (8.40)
Mother employed (Sib. 2)	-0.65 (1.17)
Missing maternal employment (Sib. 2)	-5.82 (4.81)
Average Family Income (Sib. 1)	
Between 10,001 and 25,000	2.88 (1.66)
Between 25,001 and 50,000	3.74 (2.24)
More than 50,000	3.98 (3.57)
Missing	3.39 (2.55)
Average Family Income (Sib. 2)	
Between 10,001 and 25,000	-2.54 (1.66)
Between 25,001 and 50,000	-2.89 (2.29)
More than 50,000	-2.35 (3.36)
Missing	-5.79 (4.00)
Mother's Education (Sib. 1)	
High School Diploma	-0.85 (1.60)
Some College	-2.42 (2.10)
Bachelor's degree	1.18 (2.41)
Missing	29.7 (20.0)
Siblings Race/Ethnicity	
Black	0.15

	(1.66)
Hispanic	-1.98
	(1.61)
Rosenberg Quartile	
2 nd Quartile	0.95
	(1.42)
3 rd Quartile	-1.16
	(1.65)
4 th Quartile	-3.11*
	(1.51)
Missing Rosenberg	2.14
	(3.18)
AFQT Quartile	
2 nd Quartile	2.21
	(1.67)
3 rd Quartile	5.74**
	(2.15)
4 th Quartile	4.39
	(2.37)
Missing AFQT	-6.86
	(3.69)
Rotter Quartile	
2 nd Quartile	0.90
	(1.60)
3 rd Quartile	2.69
	(1.64)
4 th Quartile	0.98
	(1.79)
Missing Rotter	5.14
	(3.01)
Magazines, newspapers, library card in mom's house at age 14	1.13
	(1.53)
Missing magazines, newspapers, library card	4.26
	(3.02)
Mom married before 1 st birth	0.70
	(1.74)
Mom married within a year after 1 st birth	-1.39
	(2.93)
Missing mom marriage date	-1.79
	(2.24)
Mean Dependent Variable	109.5
SD Dependent Variable	19.8
Observations	1345

Notes: Standard errors in parentheses clustered at the mother level. Average family income in real dollars. All regressions include a dummy for each year of test for each sibling. * $p < 0.05$, ** $p < 0.01$

Table A3. Estimates of the Effect of Head Start and Preschool on PPVT Score by Age from Mother's Fixed Effects Model.

	Ages 4-5
Δ Head Start	-0.89 (1.29)
Δ Preschool	-1.16 (1.01)
Δ Female	2.54** (0.74)
Δ Children's age in months	0.96 (1.06)
Δ Children's age in months squared	0.0013 (0.0092)
Birthweight	
Δ 90 to 104 oz	1.29 (1.74)
Δ 105 to 129 oz	0.83 (1.48)
Δ 130 oz and More	-0.67 (1.76)
Δ Missing	-0.47 (1.83)
Mother's age at birth	
Δ 19-23	-3.10 (2.14)
Δ 24-30	-2.91 (2.59)
Δ 31-35	-1.94 (2.89)
Δ Over 35	-0.54 (3.16)
Average Family Income	
Δ 10,001-25,000	2.74* (1.34)
Δ 25,001-50,000	4.57* (1.93)
Δ More than 50,000	3.54 (3.06)
Δ Missing	2.48 (2.64)
Δ Mother employed	1.20 (1.03)
Δ Missing maternal employment	2.91 (4.08)
Mother's Marital Status	
Δ Married	0.13 (2.05)
Δ Separated/Divorced	-1.43 (2.21)
Δ Missing	-9.41 (6.47)
Mean Dependent Variable	109.5
SD Dependent Variable	19.8
Observations	1345

Notes: Standard errors in parentheses clustered at the mother level. Average family income in real dollars. All regressions include a dummy for each year of test of sibling 1. * $p < 0.05$, ** $p < 0.01$

Table A4. Estimates of the Effect of Head Start and Preschool on PIAT Math Score by Age from Unrestricted First Difference Model.

	Ages 5-6	Ages 7-8	Ages 9-10	Ages 11-12
Head Start (Sib. 1)	0.13 (0.53)	0.87 (0.85)	1.20 (0.87)	-0.84 (0.88)
Preschool (Sib. 1)	-0.59 (0.39)	-0.47 (0.66)	-0.17 (0.76)	-0.45 (0.73)
Head Start (Sib. 2)	0.12 (0.47)	0.31 (0.89)	0.24 (0.88)	1.31 (0.87)
Preschool (Sib. 2)	-0.20 (0.41)	0.50 (0.62)	0.92 (0.71)	1.36 (0.71)
Sibling 1 age in months	-1.00* (0.49)	-0.22 (1.02)	1.23 (1.40)	-0.75 (1.61)
Sibling 2 age in months	1.78** (0.53)	0.14 (1.06)	-2.53 (1.51)	1.36 (1.71)
Sibling 1 age in months squared	0.010** (0.0035)	0.0048 (0.0054)	-0.0034 (0.0059)	0.0035 (0.0057)
Sibling 2 age in months squared	-0.016** (0.0037)	-0.0049 (0.0056)	0.0088 (0.0063)	-0.0053 (0.0060)
Female (Sib. 1)	0.049 (0.30)	-0.069 (0.46)	-0.45 (0.49)	-0.58 (0.51)
Female (Sib. 2)	-0.78* (0.31)	-0.090 (0.48)	0.55 (0.51)	1.90** (0.51)
Birthweight (Sib. 1)				
90 to 104 oz	0.13 (0.74)	-0.086 (1.05)	0.56 (1.02)	-2.13* (1.03)
105 to 129 oz	0.086 (0.71)	1.12 (0.94)	1.19 (0.88)	-0.31 (0.94)
130 oz and More	0.017 (0.73)	0.92 (1.09)	1.25 (1.03)	-0.45 (1.09)
Missing	0.13 (0.88)	0.33 (1.46)	2.44 (1.64)	1.65 (1.59)
Birthweight (Sib. 2)				
90 to 104 oz	-0.55 (0.65)	0.11 (1.15)	-0.43 (1.14)	-0.27 (1.27)
105 to 129 oz	-1.18* (0.57)	-1.60 (1.01)	-2.01* (1.02)	-2.02 (1.17)
130 oz and More	-0.74 (0.58)	-1.51 (1.13)	-2.60* (1.12)	-1.74 (1.29)

Missing	-1.00 (0.69)	-1.70 (1.21)	-2.52* (1.12)	-2.16 (1.42)
Mother's Age at Birth (Sib. 1)				
19-23	0.63 (0.65)	-0.84 (0.99)	-0.73 (0.98)	-0.82 (0.93)
24-30	1.09 (0.93)	-2.31 (1.47)	-2.46 (1.45)	-1.64 (1.54)
31-35	1.57 (1.31)	-3.47 (2.10)	-4.64* (2.34)	-2.76 (2.31)
Over 35	1.34 (2.56)	-4.06 (3.47)	-9.20* (4.14)	-6.06 (4.04)
Mother's Age at Birth (Sib. 2)				
19-23	0.89 (1.99)	1.17 (2.39)	2.92 (2.11)	-0.68 (1.84)
24-30	0.80 (2.12)	0.64 (2.60)	3.54 (2.32)	-0.94 (2.19)
31-35	1.26 (2.25)	1.19 (2.83)	2.96 (2.61)	-1.16 (2.58)
Over 35	1.92 (2.46)	1.03 (3.27)	3.19 (3.08)	-2.00 (3.13)
Mother's marital status (Sib. 1)				
Married	1.97* (0.89)	0.15 (1.52)	0.19 (1.50)	3.94* (1.86)
Separated/Divorced	1.08 (0.86)	-0.64 (1.50)	0.16 (1.58)	1.73 (1.83)
Missing	-3.89 (3.10)	-6.96 (6.25)	-14.1** (4.08)	-2.04 (8.56)
Mother's marital status (Sib. 2)				
Married	-2.09* (0.84)	-0.54 (1.61)	-0.84 (1.60)	-4.98** (1.88)
Separated/Divorced	-1.86* (0.82)	-1.07 (1.57)	0.25 (1.65)	-3.75* (1.86)
Missing	-0.73 (3.00)	0.26 (3.47)	9.08* (4.40)	-5.33 (3.67)
Mother employed (Sib. 1)	-0.40 (0.38)	-0.34 (0.58)	-1.29* (0.62)	0.080 (0.63)
Missing maternal employment (Sib. 1)	0.86 (1.67)	5.67** (1.98)	0.87 (2.35)	2.98 (1.73)
Mother employed (Sib. 2)	0.012 (0.38)	0.076 (0.60)	0.15 (0.63)	-0.92 (0.70)
Missing maternal employment (Sib. 2)	-0.55	0.75	-0.89	0.33

	(1.59)	(2.33)	(2.00)	(1.90)
Average Family Income (Sib. 1)				
Between 10,001 and 25,000	-0.15 (0.50)	-0.069 (0.90)	-1.74 (0.90)	-2.80** (0.96)
Between 25,001 and 50,000	0.025 (0.68)	1.61 (1.20)	-0.0041 (1.27)	-2.34 (1.40)
More than 50,000	-0.98 (1.03)	1.84 (1.87)	1.91 (1.78)	-1.02 (2.12)
Missing	-0.11 (0.92)	0.56 (1.55)	-0.11 (1.79)	-4.26 (2.62)
Average Family Income (Sib. 2)				
Between 10,001 and 25,000	-0.017 (0.56)	0.97 (0.95)	1.43 (0.92)	2.11* (1.00)
Between 25,001 and 50,000	0.094 (0.75)	-0.50 (1.17)	0.60 (1.25)	0.76 (1.37)
More than 50,000	0.86 (1.01)	-0.46 (1.73)	0.16 (1.71)	0.56 (1.91)
Missing	0.0041 (1.45)	0.47 (2.13)	2.00 (2.90)	2.21 (3.35)
Mother's Education (Sib. 1)				
High School Diploma	0.52 (0.40)	-0.96 (0.78)	1.24 (0.83)	-0.014 (0.71)
Some College	0.68 (0.51)	-1.62 (0.97)	0.91 (0.99)	0.12 (0.98)
Bachelor's degree	0.89 (0.66)	-1.61 (1.15)	1.08 (1.24)	1.13 (1.19)
Missing	2.71 (2.41)	-5.44** (1.64)	16.5** (2.37)	
Siblings Race/Ethnicity				
Black	-0.21 (0.46)	1.08 (0.78)	-0.72 (0.87)	-0.52 (0.87)
Hispanic	-0.24 (0.46)	-0.19 (0.77)	-0.21 (0.83)	-0.28 (0.87)
Rosenberg Quartile				
2 nd Quartile	-0.18 (0.42)	0.33 (0.65)	0.32 (0.73)	0.51 (0.69)
3 rd Quartile	-0.81 (0.49)	0.040 (0.79)	-0.073 (0.85)	0.18 (0.75)
4 th Quartile	-0.086 (0.41)	-0.45 (0.66)	-0.34 (0.65)	0.73 (0.72)
Missing Rosenberg	0.46 (1.02)	0.28 (1.69)	-0.060 (2.41)	-4.15** (1.53)

AFQT Quartile				
2 nd Quartile	-0.62	0.54	-0.46	-0.20
	(0.45)	(0.74)	(0.74)	(0.82)
3 rd Quartile	0.082	1.00	0.97	-0.0070
	(0.49)	(0.86)	(0.89)	(0.95)
4 th Quartile	-0.83	1.34	0.54	0.38
	(0.59)	(1.05)	(1.12)	(1.12)
Missing AFQT	-1.70	0.64	-0.31	0.64
	(1.19)	(1.47)	(1.30)	(1.76)
Rotter Quartile				
2 nd Quartile	0.13	-0.52	0.32	0.44
	(0.44)	(0.79)	(0.79)	(0.84)
3 rd Quartile	-0.053	-0.40	-0.24	-0.47
	(0.45)	(0.80)	(0.80)	(0.84)
4 th Quartile	-0.49	-1.30	-1.03	-1.21
	(0.48)	(0.81)	(0.87)	(0.89)
Missing Rotter	2.76*	4.77**	1.09	-3.94
	(1.20)	(1.47)	(1.64)	(2.34)
Magazines, newspapers, library card in mom's house at age 14	0.98*	0.66	0.42	0.047
	(0.41)	(0.69)	(0.80)	(0.75)
Missing magazines, newspapers, library card	3.84**	-2.39	7.06	-3.34
	(1.01)	(2.39)	(5.81)	(3.31)
Mom married before 1 st birth	-0.13	0.67	-0.38	-0.21
	(0.44)	(0.76)	(0.80)	(0.78)
Mom married within a year after 1 st birth	-0.38	0.88	1.78	1.26
	(0.78)	(1.16)	(1.42)	(1.30)
Missing mom marriage date	0.56	2.04	2.42	-0.27
	(0.91)	(1.27)	(2.13)	(1.47)
Mean Dependent Variable	15.7	30.0	43.2	50.6
SD Dependent Variable	6.7	10.8	10.9	11.0
Observations	2371	2576	2623	2563

Notes: Standard errors in parentheses clustered at the mother level. Average family income in real dollars. All regressions include a dummy for each year of test for each sibling. * $p < 0.05$, ** $p < 0.01$

Table A5. Estimates of the Effect of Head Start and Preschool on PIAT Math Score by Age from Mother's Fixed Effects Model.

	Ages 5-6	Ages 7-8	Ages 9-10	Ages 11-12
Δ Head Start	0.0084 (0.43)	0.44 (0.75)	0.67 (0.74)	-0.84 (0.77)
Δ Preschool	-0.22 (0.32)	-0.38 (0.52)	-0.45 (0.62)	-0.98 (0.63)
Δ Female	0.43* (0.21)	0.044 (0.34)	-0.42 (0.35)	-1.15** (0.36)
Δ Children's age in months	-1.38** (0.36)	-0.32 (0.77)	1.55 (1.08)	-0.90 (1.26)
Δ Children's age in months squared	0.013** (0.0026)	0.0056 (0.0041)	-0.0047 (0.0045)	0.0038 (0.0044)
Birthweight				
Δ 90 to 104 oz	0.38 (0.56)	-0.085 (0.87)	0.60 (0.87)	-1.03 (0.92)
Δ 105 to 129 oz	0.68 (0.56)	1.33 (0.82)	1.71* (0.79)	0.96 (0.89)
Δ 130 oz and More	0.46 (0.56)	1.22 (0.92)	2.21* (0.90)	0.88 (1.01)
Δ Missing	0.68 (0.63)	0.72 (0.98)	2.52* (1.00)	1.54 (1.13)
Mother's age at birth				
Δ 19-23	0.66 (0.57)	-1.10 (0.90)	-0.33 (0.88)	-0.75 (0.80)
Δ 24-30	0.82 (0.71)	-1.48 (1.14)	-0.52 (1.13)	-0.55 (1.03)
Δ 31-35	0.77 (0.77)	-1.37 (1.24)	0.77 (1.28)	0.17 (1.18)
Δ Over 35	1.41 (0.84)	-1.36 (1.42)	1.89 (1.53)	0.84 (1.42)
Average Family Income				
Δ 10,001-25,000	-0.12 (0.45)	-0.24 (0.80)	-1.38 (0.79)	-2.36** (0.85)
Δ 25,001-50,000	-0.034 (0.66)	1.16 (1.04)	0.014 (1.11)	-1.31 (1.26)
Δ More than 50,000	-0.66 (0.92)	1.07 (1.57)	0.36 (1.56)	-0.86 (1.84)
Δ Missing	0.24 (0.88)	0.18 (1.50)	-0.26 (1.68)	-3.60 (3.04)
Δ Mother employed	-0.15 (0.33)	-0.19 (0.50)	-0.65 (0.52)	0.37 (0.56)

Δ Missing maternal employment	0.58 (1.34)	2.57 (1.72)	1.07 (1.65)	1.20 (1.34)
Mother's Marital Status				
Δ Married	1.80* (0.77)	0.35 (1.37)	0.28 (1.43)	3.13 (1.68)
Δ Separated/Divorced	1.36 (0.74)	0.38 (1.35)	-0.30 (1.54)	1.36 (1.68)
Δ Missing	1.68 (2.53)	-5.38 (4.40)	-4.85 (3.71)	1.59 (4.29)
Mean Dependent Variable	15.7	30.0	43.2	50.6
SD Dependent Variable	6.7	10.8	10.9	11.0
Observations	2371	2576	2623	2563

Notes: Standard errors in parentheses clustered at the mother level. Average family income in real dollars. All regressions include a dummy for each year of test of sibling
1. * $p < 0.05$, ** $p < 0.01$

Table A6. Estimates of the Effect of Head Start and Preschool on PIAT Reading Recognition Score by Age from Unrestricted First Difference Model.

	Ages 5-6	Ages 7-8	Ages 9-10	Ages 11-12
Head Start (Sib. 1)	0.90 (0.55)	1.56* (0.79)	1.47 (0.92)	-0.33 (1.05)
Preschool (Sib. 1)	0.28 (0.46)	0.095 (0.70)	-0.73 (0.90)	-0.24 (0.94)
Head Start (Sib. 2)	0.57 (0.48)	0.61 (0.78)	1.52 (0.91)	1.09 (1.06)
Preschool (Sib. 2)	-0.057 (0.43)	0.47 (0.66)	1.51 (0.86)	1.57 (0.94)
Sibling 1 age in months	-0.46 (0.60)	1.50 (1.04)	-0.53 (1.65)	0.28 (2.13)
Sibling 2 age in months	0.56 (0.54)	-0.37 (1.08)	-0.20 (1.73)	1.21 (2.07)
Sibling 1 age in months squared	0.0069 (0.0043)	-0.0050 (0.0055)	0.0043 (0.0069)	-0.000046 (0.0075)
Sibling 2 age in months squared	-0.0076* (0.0038)	-0.0011 (0.0057)	-0.0012 (0.0073)	-0.0050 (0.0072)
Female (Sib. 1)	0.79* (0.32)	1.35** (0.48)	0.87 (0.61)	1.53* (0.65)
Female (Sib. 2)	-0.85** (0.31)	-2.25** (0.48)	-2.15** (0.57)	-1.49* (0.66)
Birthweight (Sib. 1)				
90 to 104 oz	-0.38 (0.78)	-1.12 (1.09)	-0.39 (1.20)	-0.33 (1.40)
105 to 129 oz	0.20 (0.76)	0.071 (1.01)	1.08 (1.08)	0.76 (1.26)
130 oz and More	0.21 (0.79)	0.17 (1.08)	1.16 (1.24)	0.57 (1.43)
Missing	-0.32 (0.86)	1.40 (1.45)	2.55 (1.72)	2.81 (1.93)
Birthweight (Sib. 2)				
90 to 104 oz	0.085 (0.66)	1.46 (1.08)	-0.71 (1.34)	-1.21 (1.58)
105 to 129 oz	-0.44 (0.61)	-0.18 (0.96)	-2.12 (1.16)	-2.56 (1.40)
130 oz and More	-0.57 (0.63)	-0.21 (1.05)	-1.93 (1.30)	-2.49 (1.51)
Missing	-0.28	-0.36	-2.55	-2.78

	(0.73)	(1.14)	(1.38)	(1.63)
Mother's Age at Birth (Sib. 1)				
19-23	0.90 (0.67)	-0.60 (0.92)	0.036 (1.11)	0.83 (1.22)
24-30	0.91 (0.96)	-1.89 (1.34)	0.54 (1.67)	2.04 (1.95)
31-35	1.57 (1.40)	-0.94 (2.24)	3.11 (2.92)	3.07 (3.03)
Over 35	1.51 (2.43)	-0.64 (3.24)	0.67 (4.35)	0.23 (5.90)
Mother's Age at Birth (Sib. 2)				
19-23	1.05 (1.77)	0.065 (2.51)	-1.04 (2.47)	1.75 (2.55)
24-30	0.52 (1.89)	1.04 (2.74)	-2.54 (2.81)	-1.41 (3.05)
31-35	-0.0035 (2.07)	1.23 (3.02)	-4.00 (3.18)	-3.40 (3.43)
Over 35	-0.13 (2.38)	1.39 (3.49)	-5.57 (3.74)	-3.53 (4.10)
Mother's marital status (Sib. 1)				
Married	0.62 (0.94)	1.64 (1.73)	-1.18 (1.87)	3.60 (2.88)
Separated/Divorced	-0.20 (0.94)	0.33 (1.77)	-1.60 (1.98)	2.14 (2.98)
Missing	12.7** (2.61)	-11.0* (4.61)	15.7** (5.50)	-1.72 (8.04)
Mother's marital status (Sib. 2)				
Married	-0.78 (0.94)	-0.78 (1.74)	0.52 (2.02)	-3.32 (2.98)
Separated/Divorced	-0.11 (0.92)	-0.087 (1.80)	1.46 (2.11)	-2.00 (2.99)
Missing	-4.66 (3.38)	-18.9** (4.21)	11.3* (4.88)	-3.31 (5.40)
Mother employed (Sib. 1)	-0.26 (0.36)	0.56 (0.57)	-0.40 (0.65)	-0.80 (0.78)
Missing maternal employment (Sib. 1)	-0.052 (2.07)	-0.15 (1.96)	3.11 (2.60)	1.70 (2.48)
Mother employed (Sib. 2)	0.13 (0.37)	-0.81 (0.60)	0.29 (0.72)	0.28 (0.87)
Missing maternal employment (Sib. 2)	1.21 (0.93)	7.42* (2.91)	-1.06 (2.70)	-3.74 (2.94)

Average Family Income (Sib. 1)				
Between 10,001 and 25,000	-0.054	0.85	1.76	-0.021
	(0.56)	(0.87)	(1.19)	(1.33)
Between 25,001 and 50,000	0.25	1.16	3.37*	-0.22
	(0.82)	(1.24)	(1.68)	(1.80)
More than 50,000	-0.96	-0.18	4.22	0.71
	(1.25)	(1.77)	(2.83)	(2.60)
Missing	-1.93*	-0.24	4.81	-0.82
	(0.87)	(1.57)	(2.87)	(4.55)
Average Family Income (Sib. 2)				
Between 10,001 and 25,000	0.17	-0.91	-0.79	-0.53
	(0.59)	(0.91)	(1.22)	(1.33)
Between 25,001 and 50,000	-0.034	-1.03	-1.69	-1.22
	(0.84)	(1.18)	(1.66)	(1.79)
More than 50,000	0.52	1.22	-1.51	-1.69
	(1.32)	(1.66)	(2.51)	(2.39)
Missing	2.91*	-2.17	-3.21	0.90
	(1.30)	(2.40)	(3.95)	(4.92)
Mother's Education (Sib. 1)				
High School Diploma	0.21	0.071	0.24	-0.76
	(0.49)	(0.73)	(0.94)	(1.04)
Some College	-0.38	-1.50	-0.16	-1.34
	(0.62)	(0.94)	(1.27)	(1.34)
Bachelor's degree	0.70	-0.21	0.64	0.91
	(0.80)	(1.18)	(1.61)	(1.59)
Missing	-5.67**	2.27	-21.8**	
	(1.13)	(1.66)	(2.87)	
Siblings Race/Ethnicity				
Black	0.20	1.22	-0.11	-0.65
	(0.52)	(0.77)	(1.03)	(1.07)
Hispanic	-0.36	-0.79	-0.85	-2.23*
	(0.52)	(0.76)	(1.02)	(1.13)
Rosenberg Quartile				
2 nd Quartile	-0.025	-0.20	-0.39	0.48
	(0.43)	(0.66)	(0.86)	(0.91)
3 rd Quartile	-0.72	-1.23	-1.40	0.82
	(0.51)	(0.80)	(0.99)	(1.01)
4 th Quartile	0.16	-0.81	-0.62	-0.22
	(0.45)	(0.73)	(0.83)	(0.93)
Missing Rosenberg	0.71	-0.80	-2.46	-0.27
	(1.24)	(1.96)	(2.45)	(2.59)
AFQT Quartile				

2 nd Quartile	-0.17 (0.46)	1.87* (0.74)	-0.25 (0.86)	1.19 (0.97)
3 rd Quartile	0.94 (0.59)	3.17** (0.88)	1.38 (1.01)	1.56 (1.21)
4 th Quartile	-0.0053 (0.65)	2.70** (1.01)	0.90 (1.37)	0.38 (1.38)
Missing AFQT	-0.82 (1.23)	0.31 (1.56)	-0.16 (2.15)	-1.43 (2.29)
Rotter Quartile				
2 nd Quartile	-0.64 (0.46)	-0.86 (0.85)	0.20 (1.03)	-0.23 (1.04)
3 rd Quartile	-0.67 (0.50)	-0.97 (0.83)	-0.52 (1.02)	-1.19 (1.04)
4 th Quartile	-0.97* (0.48)	-0.33 (0.84)	-1.12 (1.07)	-1.94 (1.14)
Missing Rotter	3.03 (1.85)	4.75** (1.75)	1.53 (1.88)	2.86 (2.46)
Magazines, newspapers, library card in mom's house at age 14	0.35 (0.48)	0.17 (0.76)	-0.18 (0.90)	-0.85 (1.00)
Missing magazines, newspapers, library card	2.80 (2.15)	2.05 (2.04)	2.02 (3.83)	-7.34* (3.56)
Mom married before 1 st birth	0.32 (0.44)	-1.17 (0.73)	-0.87 (0.91)	-0.95 (1.01)
Mom married within a year after 1 st birth	0.22 (0.89)	-0.67 (1.22)	1.74 (1.41)	-1.24 (1.63)
Missing mom marriage date	0.42 (0.84)	1.40 (1.60)	1.11 (1.49)	0.93 (2.13)
Mean Dependent Variable	17.3	32.9	45.2	53.9
SD Dependent Variable	7.1	10.8	12.9	13.9
Observations	2286	2574	2615	2556

Notes: Standard errors in parentheses clustered at the mother level. Average family income in real dollars. All regressions include a dummy for each year of test for each sibling. * $p < 0.05$, ** $p < 0.01$

Table A7. Estimates of the Effect of Head Start and Preschool on PIAT Reading Recognition Score by Age from Mother's Fixed Effects Model.

	Ages 5-6	Ages 7-8	Ages 9-10	Ages 11-12
Δ Head Start	0.11 (0.44)	0.34 (0.68)	-0.21 (0.77)	-0.70 (0.90)
Δ Preschool	0.075 (0.37)	-0.24 (0.58)	-1.32 (0.74)	-1.04 (0.80)
Δ Female	0.78** (0.22)	1.79** (0.35)	1.60** (0.42)	1.47** (0.48)
Δ Children's age in months	-0.44 (0.38)	0.87 (0.77)	-0.13 (1.27)	-0.58 (1.53)
Δ Children's age in months squared	0.0068* (0.0027)	-0.0015 (0.0041)	0.0026 (0.0054)	0.0029 (0.0054)
Birthweight				
Δ 90 to 104 oz	-0.15 (0.59)	-1.23 (0.92)	0.18 (0.97)	0.33 (1.17)
Δ 105 to 129 oz	0.42 (0.61)	0.17 (0.85)	1.73 (0.94)	1.67 (1.09)
Δ 130 oz and More	0.44 (0.62)	0.31 (0.92)	1.66 (1.05)	1.56 (1.19)
Δ Missing	0.26 (0.67)	0.48 (1.09)	2.21 (1.19)	1.85 (1.31)
Mother's age at birth				
Δ 19-23	0.78 (0.57)	-0.22 (0.83)	-0.28 (1.01)	-0.080 (1.04)
Δ 24-30	1.00 (0.70)	-0.51 (1.02)	0.37 (1.27)	2.17 (1.38)
Δ 31-35	2.03* (0.79)	1.34 (1.19)	2.46 (1.51)	4.48** (1.58)
Δ Over 35	3.39** (0.82)	3.05* (1.41)	4.08* (2.01)	4.62* (1.92)
Average Family Income				
Δ 10,001-25,000	-0.072 (0.48)	1.10 (0.82)	1.27 (1.06)	0.50 (1.17)
Δ 25,001-50,000	0.37 (0.77)	1.20 (1.12)	2.50 (1.50)	0.79 (1.63)
Δ More than 50,000	-0.40 (1.18)	-1.01 (1.58)	2.37 (2.41)	1.30 (2.27)
Δ Missing	-1.99** (0.74)	0.28 (1.51)	4.50 (2.68)	-0.35 (4.48)
Δ Mother employed	-0.14 (0.31)	0.68 (0.50)	-0.43 (0.54)	-0.75 (0.68)

Δ Missing maternal employment	-0.89 (0.98)	-3.32 (1.86)	1.85 (1.95)	2.42 (2.05)
Mother's Marital Status				
Δ Married	0.91 (0.89)	1.13 (1.67)	-1.36 (1.80)	2.65 (2.71)
Δ Separated/Divorced	0.30 (0.90)	0.19 (1.73)	-2.06 (1.97)	1.10 (2.76)
Δ Missing	5.84 (3.15)	5.08 (7.07)	-9.53* (4.20)	1.31 (5.24)
Mean Dependent Variable	17.3	32.9	45.2	53.9
SD Dependent Variable	7.1	10.8	12.9	13.9
Observations	2286	2574	2615	2556

Notes: Standard errors in parentheses clustered at the mother level. Average family income in real dollars. All regressions include a dummy for each year of test of sibling
1. * $p < 0.05$, ** $p < 0.01$

Table A8. Estimates of the Effect of Head Start and Preschool on PIAT Reading Comprehension Score by Age from Unrestricted First Difference Model.

	Ages 5-6	Ages 7-8	Ages 9-10	Ages 11-12
Head Start (Sib. 1)	1.03 (0.54)	0.82 (0.74)	0.73 (0.86)	0.23 (0.87)
Preschool (Sib. 1)	0.12 (0.44)	-0.65 (0.67)	-0.74 (0.84)	0.12 (0.76)
Head Start (Sib. 2)	0.11 (0.48)	0.96 (0.70)	1.72* (0.82)	2.09* (0.84)
Preschool (Sib. 2)	-0.12 (0.42)	0.58 (0.63)	0.27 (0.79)	1.19 (0.77)
Sibling 1 age in months	0.028 (0.54)	0.023 (1.03)	0.074 (1.56)	0.67 (1.76)
Sibling 2 age in months	0.33 (0.53)	-1.76 (0.98)	-1.33 (1.52)	0.21 (1.83)
Sibling 1 age in months squared	0.0030 (0.0038)	0.0025 (0.0054)	0.0011 (0.0066)	-0.0015 (0.0062)
Sibling 2 age in months squared	-0.0056 (0.0037)	0.0065 (0.0051)	0.0043 (0.0064)	-0.0013 (0.0064)
Female (Sib. 1)	0.91** (0.30)	1.39** (0.46)	0.85 (0.54)	0.72 (0.54)
Female (Sib. 2)	-0.86** (0.30)	-2.13** (0.46)	-1.96** (0.52)	-0.26 (0.55)
Birthweight (Sib. 1)				
90 to 104 oz	-0.53 (0.77)	-1.12 (1.02)	0.19 (1.14)	-0.63 (1.16)
105 to 129 oz	-0.025 (0.75)	-0.18 (0.94)	0.92 (1.00)	0.29 (1.03)
130 oz and More	0.086 (0.79)	0.17 (1.03)	0.18 (1.18)	0.75 (1.19)
Missing	-0.87 (0.84)	1.42 (1.41)	3.14* (1.56)	1.39 (1.75)
Birthweight (Sib. 2)				
90 to 104 oz	0.44 (0.70)	1.50 (1.18)	0.036 (1.34)	-0.15 (1.41)
105 to 129 oz	-0.34 (0.64)	-0.72 (1.09)	-0.23 (1.17)	-1.00 (1.26)
130 oz and More	-0.24 (0.64)	-0.34 (1.17)	-0.78 (1.29)	-0.31 (1.37)
Missing	0.48	-0.098	-1.57	-0.21

	(0.69)	(1.20)	(1.32)	(1.47)
Mother's Age at Birth (Sib. 1)				
19-23	1.40*	-0.49	-0.98	-0.62
	(0.68)	(0.97)	(1.13)	(1.03)
24-30	1.20	-1.10	-2.75	-0.76
	(0.92)	(1.39)	(1.61)	(1.58)
31-35	1.41	-0.91	-2.56	-0.23
	(1.37)	(2.08)	(2.41)	(2.47)
Over 35	1.87	-1.75	-7.02	-0.64
	(2.40)	(3.05)	(4.32)	(4.32)
Mother's Age at Birth (Sib. 2)				
19-23	0.54	-0.41	1.99	4.07
	(1.95)	(2.08)	(2.49)	(2.38)
24-30	0.37	-0.42	2.01	3.44
	(2.04)	(2.41)	(2.76)	(2.74)
31-35	1.04	-1.55	2.19	2.71
	(2.17)	(2.68)	(3.09)	(3.07)
Over 35	0.46	-3.02	3.22	1.56
	(2.41)	(3.09)	(3.44)	(3.64)
Mother's marital status (Sib. 1)				
Married	0.65	0.64	-0.35	1.10
	(0.90)	(1.64)	(1.83)	(2.05)
Separated/Divorced	-0.40	-0.22	-0.97	0.61
	(0.90)	(1.63)	(1.90)	(2.08)
Missing	12.5**	-6.55	-2.43	-6.98
	(2.30)	(5.28)	(5.09)	(4.56)
Mother's marital status (Sib. 2)				
Married	-0.87	0.0036	-0.086	-1.66
	(0.90)	(1.63)	(1.93)	(2.10)
Separated/Divorced	0.21	0.43	1.95	-1.41
	(0.91)	(1.69)	(2.00)	(2.13)
Missing	-1.85	-14.5**	12.2*	-0.55
	(1.90)	(3.86)	(4.79)	(4.68)
Mother employed (Sib. 1)	-0.021	-0.055	-0.93	-0.69
	(0.35)	(0.53)	(0.62)	(0.68)
Missing maternal employment (Sib. 1)	-0.72	-1.49	1.39	1.77
	(1.72)	(2.36)	(2.24)	(2.10)
Mother employed (Sib. 2)	-0.17	-0.91	0.30	-0.11
	(0.36)	(0.55)	(0.65)	(0.70)
Missing maternal employment (Sib. 2)	0.99	6.02*	-2.54	2.77
	(0.99)	(2.73)	(2.68)	(1.74)

Average Family Income (Sib. 1)				
Between 10,001 and 25,000	0.18 (0.51)	1.51 (0.85)	0.41 (1.07)	0.76 (1.10)
Between 25,001 and 50,000	0.23 (0.68)	1.89 (1.19)	1.04 (1.48)	1.62 (1.57)
More than 50,000	-0.59 (1.04)	3.53* (1.70)	3.41 (2.24)	3.91 (2.43)
Missing	-0.90 (0.83)	1.35 (1.47)	0.72 (2.42)	-1.93 (3.56)
Average Family Income (Sib. 2)				
Between 10,001 and 25,000	-0.41 (0.61)	-0.93 (0.84)	-0.24 (1.07)	-0.79 (1.05)
Between 25,001 and 50,000	-0.11 (0.83)	-1.19 (1.14)	-0.36 (1.41)	-2.07 (1.49)
More than 50,000	0.65 (1.14)	-0.23 (1.59)	-0.32 (2.00)	-1.53 (2.24)
Missing	1.65 (1.02)	-1.97 (2.15)	-1.79 (2.94)	-1.33 (4.07)
Mother's Education (Sib. 1)				
High School Diploma	0.59 (0.48)	0.52 (0.69)	0.69 (0.82)	0.67 (0.82)
Some College	-0.11 (0.61)	-0.36 (0.92)	0.31 (1.08)	0.62 (1.07)
Bachelor's degree	0.22 (0.76)	0.82 (1.15)	1.41 (1.40)	0.85 (1.38)
Missing	-5.16** (1.05)	4.30** (1.58)	-6.04* (2.51)	
Siblings Race/Ethnicity				
Black	0.39 (0.49)	0.85 (0.78)	-1.32 (0.95)	-1.26 (0.88)
Hispanic	-0.12 (0.49)	-0.79 (0.79)	-1.20 (0.97)	-1.47 (0.85)
Rosenberg Quartile				
2 nd Quartile	0.18 (0.42)	-0.97 (0.66)	0.026 (0.80)	-0.41 (0.73)
3 rd Quartile	-0.35 (0.54)	-1.16 (0.81)	0.26 (0.92)	-0.66 (0.85)
4 th Quartile	0.22 (0.43)	-0.89 (0.72)	-0.78 (0.75)	-0.77 (0.87)
Missing Rosenberg	0.93 (1.29)	-1.53 (1.92)	2.62 (2.21)	0.037 (1.97)
AFQT Quartile				

2 nd Quartile	-0.053 (0.48)	1.50* (0.73)	0.13 (0.81)	0.62 (0.81)
3 rd Quartile	1.16* (0.56)	2.38** (0.89)	1.70 (1.05)	1.04 (0.96)
4 th Quartile	0.72 (0.64)	1.78 (1.10)	0.45 (1.26)	-0.045 (1.21)
Missing AFQT	-0.39 (1.40)	1.08 (1.41)	-0.89 (1.51)	-3.60* (1.69)
Rotter Quartile				
2 nd Quartile	-1.17** (0.45)	-0.28 (0.80)	-0.58 (0.91)	-0.063 (0.92)
3 rd Quartile	-0.40 (0.45)	-1.00 (0.80)	-0.32 (0.88)	-0.96 (0.89)
4 th Quartile	-1.05* (0.49)	-1.06 (0.80)	-1.96* (0.95)	-1.37 (0.97)
Missing Rotter	2.78 (1.53)	4.09** (1.54)	-2.40 (1.81)	2.92 (2.08)
Magazines, newspapers, library card in mom's house at age 14	0.098 (0.48)	-0.027 (0.70)	0.16 (0.80)	0.18 (0.83)
Missing magazines, newspapers, library card	2.00 (1.67)	-0.34 (3.22)	3.41 (4.37)	-3.88 (3.48)
Mom married before 1 st birth	0.14 (0.48)	-0.99 (0.71)	-1.37 (0.78)	-0.69 (0.81)
Mom married within a year after 1 st birth	-0.32 (0.88)	-0.74 (1.34)	0.67 (1.39)	0.60 (1.47)
Missing mom marriage date	1.24 (0.72)	3.72* (1.63)	-0.95 (1.46)	-1.57 (1.85)
Mean Dependent Variable	16.7	30.5	40.7	47.6
SD Dependent Variable	6.4	10.0	11.1	11.7
Observations	2140	2404	2574	2523

Notes: Standard errors in parentheses clustered at the mother level. Average family income in real dollars. All regressions include a dummy for each year of test for each sibling. * $p < 0.05$, ** $p < 0.01$

Table A9. Estimates of the Effect of Head Start and Preschool on PIAT Reading Comprehension Score by Age from Mother's Fixed Effects Model.

	Ages 5-6	Ages 7-8	Ages 9-10	Ages 11-12
Δ Head Start	0.40 (0.43)	-0.10 (0.59)	-0.58 (0.72)	-0.78 (0.73)
Δ Preschool	0.059 (0.36)	-0.52 (0.54)	-0.58 (0.69)	-0.45 (0.66)
Δ Female	0.87** (0.21)	1.76** (0.33)	1.48** (0.37)	0.54 (0.39)
Δ Children's age in months	-0.098 (0.38)	0.99 (0.70)	0.82 (1.16)	0.36 (1.32)
Δ Children's age in months squared	0.0040 (0.0027)	-0.0025 (0.0037)	-0.0020 (0.0049)	-0.00060 (0.0046)
Birthweight				
Δ 90 to 104 oz	-0.42 (0.60)	-1.13 (0.90)	0.061 (0.99)	-0.24 (0.98)
Δ 105 to 129 oz	0.22 (0.60)	0.30 (0.84)	0.68 (0.90)	0.85 (0.91)
Δ 130 oz and More	0.24 (0.62)	0.44 (0.90)	0.65 (1.04)	0.69 (1.01)
Δ Missing	-0.53 (0.63)	0.34 (1.01)	2.09* (1.06)	0.72 (1.14)
Mother's age at birth				
Δ 19-23	1.25* (0.58)	-0.45 (0.87)	-1.67 (1.01)	-1.25 (0.88)
Δ 24-30	1.20 (0.67)	-0.80 (1.06)	-2.98* (1.25)	-1.25 (1.16)
Δ 31-35	1.57* (0.72)	-0.014 (1.19)	-2.26 (1.46)	-0.55 (1.37)
Δ Over 35	3.06** (0.80)	1.90 (1.36)	-2.34 (1.72)	0.84 (1.61)
Average Family Income				
Δ 10,001-25,000	0.42 (0.44)	1.45 (0.75)	0.40 (0.98)	0.66 (0.95)
Δ 25,001-50,000	0.56 (0.68)	1.50 (1.06)	1.20 (1.31)	1.77 (1.41)
Δ More than 50,000	-0.19 (0.98)	0.98 (1.55)	1.56 (1.97)	2.01 (2.21)
Δ Missing	-0.85 (0.73)	1.46 (1.43)	0.97 (2.34)	-1.78 (3.55)
Δ Mother employed	0.13 (0.30)	0.37 (0.46)	-0.67 (0.53)	-0.43 (0.57)

Δ Missing maternal employment	-1.10 (0.86)	-3.41 (1.78)	1.55 (1.84)	-0.53 (1.50)
Mother's Marital Status				
Δ Married	0.88 (0.83)	-0.051 (1.56)	-0.64 (1.66)	0.91 (1.84)
Δ Separated/Divorced	-0.034 (0.86)	-0.60 (1.58)	-2.09 (1.77)	0.43 (1.88)
Δ Missing	3.95* (1.73)	5.47 (4.70)	-9.21* (3.79)	-3.56 (3.74)
Mean Dependent Variable	16.7	30.5	40.7	47.6
SD Dependent Variable	6.4	10.0	11.1	11.7
Observations	2140	2404	2574	2523

Notes: Standard errors in parentheses clustered at the mother level. Average family income in real dollars. All regressions include a dummy for each year of test of sibling
1. * $p < 0.05$, ** $p < 0.01$

Table A10. Estimates of the Effect of Head Start and Preschool on PIAT Math Score by Age from Within-Child First Difference Model.

	Age 7-5	Age 8-6	Age 9-7	Age 10-8	Age 11-9	Age 12-10
Head Start	-0.81 (0.45)	0.16 (0.50)	-0.061 (0.46)	0.21 (0.47)	0.35 (0.45)	-0.091 (0.47)
Preschool	-0.26 (0.37)	-0.082 (0.39)	-0.0036 (0.38)	-0.60 (0.38)	-0.17 (0.37)	0.45 (0.41)
Child Age Difference	0.64 (0.59)	-0.12 (0.79)	-0.063 (0.85)	0.50 (0.66)	0.64** (0.037)	-0.27** (0.029)
Child Age Difference Square	-0.0080 (0.011)	0.011 (0.016)	0.0046 (0.017)	-0.012 (0.013)	-0.019** (0.0020)	0.0042 (0.0025)
Mother's Marital Status (final)						
Married	-0.10 (0.59)	-0.85 (0.69)	0.60 (0.68)	0.67 (0.66)	0.56 (0.65)	0.48 (0.72)
Separated/Divorced	-0.072 (0.57)	-0.86 (0.66)	0.53 (0.66)	0.57 (0.64)	0.59 (0.65)	-0.41 (0.70)
Missing	3.19 (4.28)	-3.09 (3.67)	-15.6 (8.98)	-3.31 (2.08)	-1.16 (2.63)	-1.91 (2.76)
Mother employed (final)	0.19 (0.33)	-0.31 (0.35)	0.20 (0.36)	-0.079 (0.35)	0.15 (0.33)	-0.0086 (0.38)
Missing maternal employment (final)	-0.43 (1.60)	0.24 (1.57)	0.76 (1.39)	1.69 (1.18)	2.89* (1.42)	1.76 (1.92)
Average Family Income (final)						
Between 10,001 and 25,000	0.37 (0.48)	0.086 (0.51)	-0.25 (0.51)	-0.042 (0.49)	-0.065 (0.49)	-0.79 (0.52)
Between 25,001 and 50,000	0.53 (0.57)	0.70 (0.62)	0.57 (0.61)	-0.070 (0.60)	-0.39 (0.61)	-0.71 (0.64)
More than 50,000	0.021 (0.77)	0.69 (0.79)	0.84 (0.78)	1.01 (0.76)	0.47 (0.81)	-0.23 (0.81)
Missing	-0.47 (1.33)	-3.07* (1.22)	1.02 (1.20)	4.01** (1.41)	-0.41 (1.39)	2.12 (1.84)
Female	-0.56 (0.30)	-0.12 (0.32)	-0.62* (0.31)	-1.00** (0.32)	-0.52 (0.31)	-0.63 (0.33)
Black	-1.76** (0.47)	-2.01** (0.52)	0.70 (0.50)	0.43 (0.50)	-0.55 (0.49)	-0.51 (0.51)
Hispanic	-1.08* (0.49)	-0.46 (0.52)	1.10* (0.48)	0.35 (0.50)	-0.42 (0.46)	-0.61 (0.49)
Birthweight						
90 to 104 oz	0.067 (0.69)	-0.10 (0.74)	0.19 (0.68)	0.82 (0.72)	-0.48 (0.64)	0.16 (0.69)

105 to 129 oz	1.13 (0.62)	0.73 (0.62)	0.62 (0.59)	0.45 (0.63)	-0.79 (0.56)	-0.11 (0.56)
130 oz and More	1.24 (0.66)	0.68 (0.66)	-0.11 (0.63)	0.50 (0.66)	-0.65 (0.61)	0.16 (0.60)
Missing	0.21 (0.75)	0.27 (0.86)	0.64 (0.74)	0.77 (0.85)	-1.22 (0.74)	0.12 (0.88)
Mother's Age at Birth						
19-23	-0.84 (0.82)	-0.27 (0.70)	1.39 (0.72)	0.19 (0.64)	0.49 (0.65)	-0.84 (0.70)
24-30	-1.36 (0.96)	-0.039 (0.86)	1.98* (0.87)	-0.53 (0.83)	0.71 (0.80)	-0.91 (0.90)
31-35	-1.80 (1.16)	0.80 (1.15)	2.18 (1.11)	0.65 (1.14)	0.29 (1.05)	-1.03 (1.19)
Over 35	-1.71 (1.50)	0.63 (1.56)	3.68** (1.43)	1.14 (1.45)	0.22 (1.44)	-0.90 (1.51)
Mother's Education (final)						
High School Diploma	0.70 (0.47)	2.01** (0.53)	-0.30 (0.50)	-0.50 (0.53)	0.069 (0.49)	1.17* (0.57)
Some College	1.12 (0.58)	2.20** (0.59)	-0.15 (0.60)	0.020 (0.61)	0.027 (0.57)	0.97 (0.63)
Bachelor's degree	2.45** (0.73)	2.53** (0.75)	-1.83* (0.72)	-0.78 (0.73)	-0.19 (0.72)	1.19 (0.76)
Missing	0.19 (3.90)	2.52 (2.54)	10.3 (8.22)	1.73* (0.82)		2.11 (1.34)
Magazines, newspapers, library card in mom's house at age 14	0.98 (0.52)	0.34 (0.54)	0.38 (0.48)	-0.35 (0.50)	0.28 (0.46)	-0.49 (0.54)
Missing magazines, newspapers, library card	1.77 (2.35)	6.49* (2.66)	1.84 (2.77)	-4.58* (1.78)	-0.53 (1.74)	-2.25 (1.17)
Mom married before 1 st birth	-0.18 (0.47)	0.23 (0.50)	0.023 (0.48)	0.65 (0.49)	-1.01* (0.46)	0.12 (0.51)
Mom married within a year after 1 st birth	0.059 (0.82)	0.072 (0.81)	-0.44 (0.84)	0.82 (0.86)	-0.81 (0.74)	0.98 (0.83)
Missing mom marriage date	1.03 (0.89)	-1.02 (1.11)	-1.79 (1.02)	1.43 (1.18)	-1.21 (1.11)	1.16 (1.29)
Rosenberg Quartile						
2 nd Quartile	0.52 (0.44)	0.56 (0.49)	-0.18 (0.46)	-0.87 (0.48)	-0.15 (0.43)	0.035 (0.48)
3 rd Quartile	0.79 (0.53)	0.10 (0.51)	-0.21 (0.50)	-0.55 (0.47)	-0.22 (0.47)	-0.000069 (0.51)
4 th Quartile	0.042	0.39	0.57	-0.36	-0.35	0.72

Missing Rosenberg	(0.42) 0.61 (1.07)	(0.44) 2.28* (1.04)	(0.43) 1.24 (0.98)	(0.43) -0.53 (1.06)	(0.41) -1.53 (1.02)	(0.42) 0.34 (1.09)
AFQT Quartile						
2 nd Quartile	(0.43) 0.41 (0.43)	(0.46) 1.32** (0.46)	(0.45) 1.29** (0.45)	(0.46) -0.33 (0.46)	(0.42) 0.10 (0.42)	(0.48) 0.13 (0.48)
3 rd Quartile	(0.53) 2.45** (0.53)	(0.57) 1.40* (0.57)	(0.54) 0.65 (0.54)	(0.55) -0.12 (0.55)	(0.52) 0.11 (0.52)	(0.55) 0.47 (0.55)
4 th Quartile	(0.62) 3.10** (0.62)	(0.66) 1.51* (0.66)	(0.64) 1.48* (0.64)	(0.64) 0.50 (0.64)	(0.62) 0.64 (0.62)	(0.67) 0.58 (0.67)
Missing AFQT	(0.92) -0.55 (0.92)	(1.16) -0.90 (1.16)	(0.89) -2.19* (0.89)	(1.00) 0.42 (1.00)	(1.12) 2.43* (1.12)	(0.92) -0.25 (0.92)
Rotter Quartile						
2 nd Quartile	(0.48) -1.00* (0.48)	(0.49) -0.43 (0.49)	(0.49) 0.058 (0.49)	(0.51) 0.37 (0.51)	(0.47) -0.84 (0.47)	(0.55) -0.059 (0.55)
3 rd Quartile	(0.48) -0.70 (0.48)	(0.50) -0.096 (0.50)	(0.49) 0.39 (0.49)	(0.50) 0.27 (0.50)	(0.48) -0.62 (0.48)	(0.55) 0.069 (0.55)
4 th Quartile	(0.51) -0.65 (0.51)	(0.53) 0.20 (0.53)	(0.52) 0.91 (0.52)	(0.53) -0.15 (0.53)	(0.51) -0.67 (0.51)	(0.57) -0.016 (0.57)
Missing Rotter	(1.33) 1.68 (1.33)	(1.97) 1.03 (1.97)	(0.92) -1.23 (0.92)	(1.11) 1.64 (1.11)	(1.43) 2.38 (1.43)	(1.22) 0.18 (1.22)
Mean Dependent Variable	27.2	35.3	42.0	46.3	50.1	52.7
SD Dependent Variable	9.35	10.6	10.7	10.4	10.5	10.8
Observations	2652	2722	2784	2744	2794	2449

Notes: Standard errors in parentheses clustered at the mother level. Average family income in real dollars. All regressions include a dummy for each year of the initial test. * $p < 0.05$, ** $p < 0.01$

Table A11. Estimates of the Effect of Head Start and Preschool on PIAT Reading Recognition Score by Age from Within-Child First Difference Model.

	Age 7-5	Age 8-6	Age 9-7	Age 10-8	Age 11-9	Age 12-10
Head Start	-0.71 (0.43)	-0.089 (0.49)	-0.74 (0.42)	-0.083 (0.42)	-0.34 (0.42)	0.30 (0.47)
Preschool	-0.42 (0.37)	0.76 (0.41)	-0.37 (0.37)	-0.51 (0.35)	-0.53 (0.37)	0.10 (0.41)
Child Age Difference	0.93 (0.71)	-0.53 (0.77)	0.18 (0.60)	1.94** (0.54)	0.70** (0.049)	0.11** (0.036)
Child Age Difference Square	-0.012 (0.014)	0.013 (0.016)	0.0021 (0.012)	-0.039** (0.011)	-0.017** (0.0022)	0.00034 (0.0026)
Mother's Marital Status (final)						
Married	0.78 (0.58)	0.57 (0.65)	-0.48 (0.62)	-0.40 (0.56)	-0.018 (0.59)	1.44* (0.69)
Separated/Divorced	0.44 (0.57)	0.028 (0.60)	-0.66 (0.60)	-0.062 (0.56)	0.26 (0.56)	-0.059 (0.67)
Missing	-10.3** (3.74)	-1.07 (3.50)	-2.02 (4.08)	4.43 (5.14)	-4.45 (2.46)	9.87* (4.96)
Mother employed (final)	0.33 (0.32)	1.21** (0.35)	0.34 (0.33)	-0.45 (0.32)	-0.095 (0.34)	0.40 (0.39)
Missing maternal employment (final)	-1.01 (1.44)	0.25 (1.24)	0.15 (1.26)	-1.30 (0.96)	0.65 (1.56)	-0.53 (1.85)
Average Family Income (final)						
Between 10,001 and 25,000	0.18 (0.48)	-0.21 (0.54)	0.89 (0.49)	0.14 (0.45)	0.74 (0.47)	-0.51 (0.52)
Between 25,001 and 50,000	0.58 (0.61)	0.47 (0.66)	1.06 (0.59)	1.42* (0.56)	0.83 (0.55)	-0.39 (0.67)
More than 50,000	-0.44 (0.85)	0.90 (0.90)	1.41 (0.76)	1.46 (0.77)	2.12** (0.74)	-0.062 (0.89)
Missing	-0.43 (1.36)	1.05 (1.09)	3.12 (1.87)	4.73* (2.07)	0.23 (1.58)	-2.44 (1.65)
Female	0.96** (0.30)	0.90** (0.32)	0.26 (0.30)	-0.18 (0.29)	-0.15 (0.29)	-0.11 (0.35)
Black	-0.91 (0.47)	-1.95** (0.53)	-0.66 (0.46)	-1.58** (0.46)	-0.87 (0.47)	0.13 (0.55)
Hispanic	0.44 (0.46)	-0.54 (0.53)	0.16 (0.48)	-0.033 (0.47)	-0.062 (0.47)	1.28* (0.51)
Birthweight						
90 to 104 oz	-0.81 (0.63)	-0.42 (0.71)	1.21 (0.66)	-0.32 (0.66)	0.030 (0.64)	0.33 (0.78)

105 to 129 oz	0.38 (0.58)	0.10 (0.61)	0.90 (0.57)	0.25 (0.53)	-0.031 (0.56)	-0.25 (0.67)
130 oz and More	0.59 (0.62)	-0.23 (0.65)	0.37 (0.61)	-0.064 (0.56)	-0.078 (0.62)	-0.37 (0.72)
Missing	0.35 (0.79)	0.13 (0.82)	-0.028 (0.78)	0.68 (0.77)	0.83 (0.78)	-0.42 (0.95)
Mother's Age at Birth						
19-23	-0.36 (0.77)	1.51* (0.72)	1.51* (0.74)	-0.14 (0.56)	0.55 (0.59)	-1.11 (0.65)
24-30	-0.81 (0.90)	1.81* (0.90)	2.56** (0.93)	0.45 (0.74)	0.028 (0.81)	-0.46 (0.87)
31-35	-2.38* (1.10)	2.78* (1.22)	3.26** (1.18)	0.92 (1.04)	-0.67 (1.13)	-1.06 (1.21)
Over 35	-2.64 (1.44)	4.32** (1.57)	3.23* (1.38)	1.98 (1.65)	-0.24 (1.47)	-3.38* (1.56)
Mother's Education (final)						
High School Diploma	0.0076 (0.44)	0.83 (0.54)	0.11 (0.50)	0.27 (0.47)	-0.30 (0.45)	-0.28 (0.53)
Some College	-0.46 (0.56)	1.33* (0.63)	0.79 (0.61)	0.89 (0.56)	0.20 (0.56)	0.73 (0.62)
Bachelor's degree	0.087 (0.72)	0.83 (0.82)	0.62 (0.73)	0.96 (0.71)	0.15 (0.72)	-0.61 (0.81)
Missing	6.41* (2.78)	0.85 (0.93)	1.21 (3.27)	-4.80 (4.21)		
Magazines, newspapers, library card in mom's house at age 14	0.57 (0.49)	-0.026 (0.53)	1.57** (0.45)	0.43 (0.46)	0.65 (0.44)	1.53** (0.49)
Missing magazines, newspapers, library card	2.16 (5.47)	-1.64 (2.72)	-0.20 (2.12)	1.31 (1.73)	-2.09 (1.28)	-1.73 (1.09)
Mom married before 1 st birth	0.14 (0.45)	0.026 (0.50)	0.0083 (0.45)	0.018 (0.44)	-0.27 (0.45)	-0.22 (0.52)
Mom married within a year after 1 st birth	0.017 (0.83)	-1.09 (0.87)	-1.08 (0.72)	-0.39 (0.72)	0.13 (0.72)	-0.015 (0.86)
Missing mom marriage date	0.49 (0.89)	-1.72 (1.11)	-0.70 (1.05)	-0.66 (0.75)	-2.76** (0.84)	0.85 (0.93)
Rosenberg Quartile						
2 nd Quartile	0.43 (0.43)	-0.52 (0.44)	0.61 (0.44)	0.28 (0.41)	-0.052 (0.40)	-0.56 (0.47)
3 rd Quartile	0.57 (0.46)	-0.14 (0.51)	0.20 (0.44)	1.11* (0.44)	0.27 (0.46)	-0.98* (0.50)
4 th Quartile	0.40	0.70	0.83*	0.013	0.50	-0.33

Missing Rosenberg	(0.45) 1.12 (1.09)	(0.49) -1.06 (1.23)	(0.42) 1.88 (1.17)	(0.41) 2.52* (1.11)	(0.41) -1.24 (0.83)	(0.48) 0.34 (1.29)
AFQT Quartile						
2 nd Quartile	0.95* (0.42)	1.53** (0.46)	1.16** (0.41)	0.29 (0.42)	0.090 (0.41)	0.82 (0.47)
3 rd Quartile	1.53** (0.56)	1.93** (0.59)	1.57** (0.52)	-0.086 (0.54)	0.44 (0.53)	1.93** (0.59)
4 th Quartile	3.26** (0.64)	2.16** (0.68)	1.50** (0.58)	0.57 (0.63)	0.63 (0.60)	1.22 (0.73)
Missing AFQT	0.096 (1.01)	0.71 (1.50)	-0.83 (1.03)	-0.83 (0.89)	0.62 (0.80)	0.025 (1.09)
Rotter Quartile						
2 nd Quartile	-0.98* (0.49)	-0.098 (0.52)	-0.59 (0.50)	-0.53 (0.47)	-0.41 (0.47)	0.23 (0.53)
3 rd Quartile	-0.13 (0.49)	-0.45 (0.52)	-0.88 (0.49)	-0.45 (0.48)	0.53 (0.46)	0.11 (0.52)
4 th Quartile	-0.14 (0.54)	-0.29 (0.56)	-0.30 (0.52)	-0.65 (0.48)	-0.23 (0.48)	1.02 (0.56)
Missing Rotter	0.077 (1.22)	1.79 (2.11)	-1.85 (1.04)	-1.02 (1.56)	2.68 (1.42)	-0.17 (1.89)
Mean Dependent Variable	30.1	38.0	43.8	49.0	53.2	57.2
SD Dependent Variable	9.56	11.0	12.1	13.0	13.2	13.9
Observations	2598	2684	2780	2740	2792	2450

Notes: Standard errors in parentheses clustered at the mother level. Average family income in real dollars. All regressions include a dummy for each year of the initial test. * $p < 0.05$, ** $p < 0.01$

Table A12. Estimates of the Effect of Head Start and Preschool on PIAT Reading Comprehension Score by Age from Within-Child First Difference Model.

	Age 7-5	Age 8-6	Age 9-7	Age 10-8	Age 11-9	Age 12-10
Head Start	-0.47 (0.40)	0.12 (0.50)	-0.18 (0.49)	-0.16 (0.49)	-0.19 (0.48)	0.23 (0.54)
Preschool	-0.42 (0.37)	0.82* (0.41)	0.031 (0.42)	-0.27 (0.41)	-0.28 (0.41)	-0.44 (0.46)
Child Age Difference	0.10 (0.51)	0.89 (0.84)	0.34 (0.90)	1.21 (0.76)	0.57** (0.037)	-0.23** (0.031)
Child Age Difference Square	0.0037 (0.0096)	-0.011 (0.018)	-0.0030 (0.018)	-0.027 (0.015)	-0.012** (0.0024)	0.0066* (0.0028)
Mother's Marital Status (final)						
Married	0.67 (0.57)	0.25 (0.71)	-0.0045 (0.72)	0.36 (0.67)	-0.48 (0.67)	0.38 (0.75)
Separated/Divorced	0.26 (0.57)	-0.58 (0.67)	0.11 (0.70)	-0.085 (0.65)	0.16 (0.67)	0.26 (0.72)
Missing	-3.11 (5.88)	4.29 (4.22)	4.18 (4.69)	2.82 (4.36)	-5.73 (4.27)	2.48 (3.48)
Mother employed (final)	0.056 (0.32)	0.73* (0.36)	0.43 (0.38)	-0.55 (0.37)	-0.033 (0.38)	-0.27 (0.44)
Missing maternal employment (final)	-0.69 (1.59)	-1.99 (1.56)	-1.00 (1.37)	-3.13 (1.80)	-1.00 (1.76)	-0.33 (1.86)
Average Family Income (final)						
Between 10,001 and 25,000	0.064 (0.44)	-0.023 (0.53)	0.35 (0.55)	-0.085 (0.52)	0.15 (0.52)	-0.043 (0.58)
Between 25,001 and 50,000	0.58 (0.55)	0.089 (0.66)	-0.062 (0.67)	0.49 (0.64)	0.55 (0.63)	0.95 (0.74)
More than 50,000	-0.30 (0.82)	0.55 (0.87)	0.53 (0.89)	0.30 (0.83)	1.60* (0.80)	0.16 (1.02)
Missing	0.72 (1.01)	0.91 (1.17)	3.21 (1.72)	0.58 (1.75)	-0.78 (2.23)	0.11 (3.82)
Female	0.78** (0.29)	0.47 (0.34)	-0.42 (0.34)	-0.52 (0.34)	-1.37** (0.33)	-0.40 (0.37)
Black	-0.76 (0.49)	-2.30** (0.54)	-1.32* (0.55)	-0.72 (0.54)	-0.52 (0.52)	-1.01 (0.62)
Hispanic	0.25 (0.46)	-1.25* (0.57)	0.054 (0.55)	1.27* (0.55)	0.93 (0.52)	-0.074 (0.61)
Birthweight						
90 to 104 oz	-1.02 (0.64)	-0.067 (0.85)	0.95 (0.72)	0.60 (0.79)	-0.99 (0.72)	0.64 (0.81)

105 to 129 oz	0.45 (0.57)	0.30 (0.75)	-0.29 (0.62)	0.94 (0.70)	-0.18 (0.65)	-0.71 (0.69)
130 oz and More	0.058 (0.61)	0.17 (0.79)	-0.076 (0.68)	0.50 (0.74)	-0.27 (0.69)	-0.72 (0.74)
Missing	0.40 (0.79)	-0.080 (0.93)	-0.98 (0.94)	1.36 (0.95)	-0.79 (0.86)	-1.47 (0.98)
Mother's Age at Birth						
19-23	-0.77 (0.85)	2.02* (0.82)	0.44 (0.86)	0.048 (0.70)	0.32 (0.73)	-1.39 (0.85)
24-30	-1.02 (0.99)	2.69** (1.01)	1.28 (1.03)	-0.62 (0.90)	0.38 (0.91)	-1.03 (1.03)
31-35	-1.31 (1.16)	4.22** (1.26)	1.36 (1.25)	-0.93 (1.20)	1.90 (1.18)	-2.03 (1.34)
Over 35	-1.91 (1.50)	4.75** (1.61)	0.69 (1.67)	-2.66 (1.63)	1.72 (1.53)	-0.45 (1.80)
Mother's Education (final)						
High School Diploma	0.041 (0.43)	1.04 (0.55)	1.48** (0.54)	0.55 (0.57)	-0.91 (0.55)	0.011 (0.56)
Some College	-0.034 (0.55)	1.41* (0.66)	1.38* (0.67)	0.67 (0.66)	0.19 (0.66)	0.91 (0.66)
Bachelor's degree	-0.20 (0.69)	1.68* (0.82)	2.03** (0.79)	1.32 (0.82)	0.30 (0.78)	0.63 (0.89)
Missing	6.16* (2.70)	1.43 (1.16)	-0.083 (3.29)	3.39 (2.98)		
Magazines, newspapers, library card in mom's house at age 14	0.70 (0.43)	0.32 (0.53)	2.14** (0.54)	0.17 (0.54)	0.097 (0.50)	-0.24 (0.62)
Missing magazines, newspapers, library card	3.68 (5.56)	1.56 (3.21)	-1.34 (0.78)	-1.48 (3.11)	-1.74* (0.89)	4.11 (2.91)
Mom married before 1 st birth	0.14 (0.44)	0.90 (0.53)	0.31 (0.53)	-0.56 (0.52)	0.045 (0.48)	0.58 (0.55)
Mom married within a year after 1 st birth	0.38 (0.86)	0.51 (0.90)	-0.043 (0.89)	0.58 (0.92)	-0.64 (1.02)	0.28 (0.96)
Missing mom marriage date	-0.27 (0.90)	-0.97 (1.12)	-1.52 (1.14)	-1.18 (1.02)	1.38 (1.03)	2.23 (1.32)
Rosenberg Quartile						
2 nd Quartile	0.56 (0.44)	-0.15 (0.47)	-0.065 (0.49)	-0.57 (0.48)	0.15 (0.47)	1.01 (0.54)
3 rd Quartile	0.22 (0.49)	0.41 (0.55)	-0.51 (0.54)	-0.23 (0.52)	-0.43 (0.53)	1.01 (0.59)
4 th Quartile	0.23	0.30	0.16	0.59	-0.61	-0.13

Missing Rosenberg	(0.44) -0.018 (1.13)	(0.51) 0.85 (1.45)	(0.48) -0.22 (1.47)	(0.47) 0.014 (1.13)	(0.47) -0.42 (1.20)	(0.53) 1.74 (1.21)
AFQT Quartile						
2 nd Quartile	0.83* (0.42)	1.61** (0.51)	0.18 (0.51)	0.37 (0.51)	0.84 (0.50)	0.21 (0.54)
3 rd Quartile	2.00** (0.54)	2.59** (0.65)	0.096 (0.62)	-0.58 (0.61)	1.84** (0.61)	0.79 (0.71)
4 th Quartile	3.45** (0.64)	2.68** (0.72)	0.36 (0.74)	0.016 (0.72)	1.98** (0.74)	1.76* (0.80)
Missing AFQT	-0.18 (0.99)	-0.18 (1.35)	1.49 (1.17)	-1.68 (0.97)	-0.54 (1.11)	1.73 (1.14)
Rotter Quartile						
2 nd Quartile	-1.75** (0.50)	0.22 (0.55)	0.38 (0.54)	-0.10 (0.52)	-0.66 (0.52)	0.27 (0.61)
3 rd Quartile	-0.66 (0.50)	0.73 (0.55)	-0.29 (0.56)	-0.89 (0.52)	-0.16 (0.53)	0.69 (0.60)
4 th Quartile	-0.82 (0.52)	0.61 (0.59)	0.55 (0.58)	-0.98 (0.55)	-0.47 (0.56)	0.93 (0.63)
Missing Rotter	1.27 (1.52)	0.27 (1.70)	-1.63 (1.62)	-0.12 (2.06)	2.98* (1.40)	-2.91 (1.75)
Mean Dependent Variable	27.8	34.9	40.2	44.0	47.7	50.3
SD Dependent Variable	8.89	10.0	10.4	10.7	11.4	11.5
Observations	2450	2484	2626	2648	2741	2408

Notes: Standard errors in parentheses clustered at the mother level. Average family income in real dollars. All regressions include a dummy for each year of the initial test. * $p < 0.05$, ** $p < 0.01$

Table A13. Estimates of the Effect of Head Start and Preschool on Total BPI Score by Age and Race/Ethnicity
 Estimates from Unrestricted First Difference Model, Restricted First Difference Model and Mother's Fixed Effects Model

	White				Black				Hispanic			
	Ages 5-6	Ages 7-8	Ages 9-10	Ages 11-12	Ages 5-6	Ages 7-8	Ages 9-10	Ages 11-12	Ages 5-6	Ages 7-8	Ages 9-10	Ages 11-12
Head Start (Sib. 1)	0.43 (1.22)	1.84 (1.08)	1.40 (1.19)	0.78 (1.01)	0.95 (0.94)	-0.78 (0.85)	-0.27 (0.80)	-0.49 (0.82)	0.97 (1.03)	-2.13 (1.15)	0.32 (1.14)	0.92 (1.10)
Head Start (Sib. 2)	2.01 (1.18)	-0.64 (1.00)	0.02 (0.97)	-0.66 (0.98)	-0.38 (0.87)	0.57 (0.88)	-0.11 (0.88)	-0.98 (0.85)	-0.13 (0.90)	-0.75 (1.14)	0.77 (0.96)	0.91 (1.05)
Head Start (1) = -Head Start (Sib. 2)	2.44* (1.20)	1.21 (1.16)	1.42 (1.15)	0.12 (1.06)	0.57 (0.94)	-0.21 (0.95)	-0.38 (0.89)	-1.47 (0.83)	0.84 (1.24)	-2.87* (1.26)	1.09 (1.29)	1.83 (1.26)
Δ Head Start (Restricted Model)	-0.85 (1.03)	1.17 (0.86)	0.66 (0.91)	0.71 (0.84)	0.66 (0.78)	-0.69 (0.72)	-0.08 (0.71)	0.23 (0.73)	0.45 (0.73)	-0.50 (0.96)	-0.30 (0.83)	-0.11 (0.87)
Δ Head Start (Mother's FE)	-0.73 (1.06)	1.16 (0.82)	0.92 (0.84)	0.68 (0.92)	0.51 (0.72)	-0.52 (0.69)	-0.01 (0.69)	0.43 (0.72)	0.34 (0.79)	-0.68 (1.05)	-0.51 (0.74)	-0.10 (0.88)
Preschool (Sib. 1)	0.46 (0.53)	0.17 (0.59)	1.28* (0.58)	0.41 (0.59)	-0.70 (0.89)	-0.40 (0.85)	-0.25 (0.84)	-0.72 (0.77)	-0.46 (0.86)	-0.42 (0.79)	1.11 (0.90)	0.63 (0.85)
Preschool (Sib. 2)	0.56 (0.57)	-0.57 (0.58)	-0.44 (0.55)	-0.42 (0.53)	-1.17 (0.83)	0.044 (0.87)	-0.011 (0.83)	-0.96 (0.83)	0.31 (0.88)	1.27 (0.93)	-0.21 (0.89)	-0.62 (0.90)
Preschool (1) = -Preschool (Sib. 2)	1.02 (0.53)	-0.40 (0.67)	0.85 (0.63)	-0.02 (0.62)	-1.87 (1.12)	-0.36 (1.00)	-0.26 (0.95)	-1.69 (0.93)	-0.16 (1.06)	0.86 (1.02)	0.89 (1.03)	0.004 (1.01)
Δ Preschool (Restricted Model)	-0.04 (0.48)	0.38 (0.48)	0.86 (0.46)	0.42 (0.47)	0.26 (0.66)	-0.23 (0.70)	-0.11 (0.69)	0.08 (0.66)	-0.43 (0.69)	-0.97 (0.70)	0.64 (0.73)	0.61 (0.71)
Δ Preschool (Mother's Fixed Effects)	0.05 (0.46)	0.47 (0.46)	1.01* (0.46)	0.50 (0.49)	0.28 (0.62)	-0.21 (0.62)	0.07 (0.66)	0.21 (0.61)	-0.17 (0.66)	-0.85 (0.71)	0.39 (0.66)	0.67 (0.68)
Mean Dependent Variable	7.8	8.4	8.3	7.8	9.2	10.3	9.4	8.9	8.5	8.9	8.5	8.5
SD Dependent Variable	5.7	6.2	6.3	6.3	6.4	6.8	6.5	6.5	6.0	6.6	6.2	6.5
Observations	1053	1100	1099	1084	651	703	786	762	498	526	521	518

Notes: Standard errors in parentheses clustered at the mother level. All regressions include the following variables for each sibling: age in months, age in months square, sex, dummies for birthweight (<90 oz, 90 to 104 oz, 105 to 129 oz, >=130 oz, missing), dummies for mother's age at child's birth (<=18, 19-23, 24-30, 31-35, >35), mother's marital status at time of the test, maternal employment status, dummies for average real family income until the time of the test (0-10,000, 10,001-25,000, 25,001-50,000, >50,000, missing), and a dummy for each year of test. Regressions also include dummies for mother's education at time of sibling 1's test (high school dropout, high school diploma, some college, bachelor's degree, missing), dummies for each Rosenberg self-esteem quartile, dummies for each AFQT quartile, dummies for each Rotter locus of control quartile, indicator for magazines, newspapers, library card in mother's house at age 14, and dummies mother's marriage date (not married, before first birth, within a year after first birth, missing date).

* $p < 0.05$, ** $p < 0.01$

Table A14. Estimates of the Effect of Head Start and Preschool on Total BPI Score by Age and Maternal AFQT for Stratified Samples
 Estimates from Unrestricted First Difference Model, Restricted First Difference Model and Mother's Fixed Effects Model

	Ages 5-6		Ages 7-8		Ages 9-10		Ages 11-12	
	Low AFQT	High AFQT	Low AFQT	High AFQT	Low AFQT	High AFQT	Low AFQT	High AFQT
Head Start (Sib. 1)	0.71 (0.75)	1.20 (0.88)	-0.83 (0.71)	0.48 (0.92)	0.27 (0.63)	1.10 (1.04)	0.68 (0.62)	-0.35 (1.04)
Head Start (Sib. 2)	0.11 (0.68)	0.84 (0.83)	0.54 (0.72)	-1.56 (0.93)	0.33 (0.68)	-0.97 (0.95)	-0.12 (0.65)	-0.58 (0.94)
Head Start (Sib.1) = -Head Start (Sib. 2)	0.81 (0.74)	2.05* (0.94)	-0.29 (0.72)	-1.09 (1.11)	0.60 (0.71)	0.13 (1.11)	0.56 (0.69)	-0.93 (1.00)
Δ Head Start (Restricted Model)	0.26 (0.61)	0.11 (0.72)	-0.67 (0.62)	1.04 (0.74)	-0.027 (0.55)	1.05 (0.82)	0.36 (0.53)	0.15 (0.85)
Δ Head Start (Mother's FE)	0.34 (0.59)	0.11 (0.71)	-0.46 (0.62)	0.83 (0.73)	-0.33 (0.53)	1.12 (0.73)	0.52 (0.53)	0.18 (0.88)
Preschool (Sib. 1)	-0.057 (0.65)	0.26 (0.48)	0.17 (0.63)	-0.031 (0.50)	0.88 (0.64)	0.99 (0.53)	-0.10 (0.60)	-0.18 (0.56)
Preschool (Sib. 2)	-0.16 (0.61)	0.33 (0.50)	0.56 (0.64)	-0.29 (0.53)	-0.059 (0.62)	-0.36 (0.49)	-1.42* (0.55)	-0.43 (0.55)
Preschool (Sib.1) = -Preschool (Sib. 2)	-0.22 (0.79)	0.59 (0.51)	0.73 (0.77)	-0.32 (0.64)	0.82 (0.73)	0.62 (0.59)	-1.52* (0.72)	-0.60 (0.57)
Δ Preschool (Restricted Model)	0.021 (0.50)	-0.015 (0.42)	-0.20 (0.51)	0.11 (0.40)	0.46 (0.51)	0.68 (0.42)	0.71 (0.45)	0.12 (0.48)
Δ Preschool (Mother's Fixed Effects)	-0.054 (0.50)	0.061 (0.42)	-0.18 (0.51)	0.17 (0.41)	0.35 (0.49)	0.80* (0.40)	0.80 (0.45)	0.027 (0.46)
Mean Dependent Variable	9.4	7.6	10.0	8.2	9.3	8.1	9.0	7.6
SD Dependent Variable	6.4	5.5	6.8	6.1	6.6	6.0	6.8	6.0
Observations	1017	1185	1122	1207	1207	1199	1193	1171

Notes: Standard errors in parentheses clustered at the mother level. All regressions include the following variables for each sibling: age in months, age in months square, sex, dummies for birthweight (<90 oz, 90 to 104 oz, 105 to 129 oz, >=130 oz, missing), dummies for mother's age at child's birth (<=18, 19-23, 24-30, 31-35, >35), mother's marital status at time of the test, maternal employment status, dummies for average real family income until the time of the test (0-10,000, 10,001-25,000, 25,001-50,000, >50,000, missing), and a dummy for each year of test. Regressions also include siblings' race/ethnicity, dummies for mother's education at time of sibling 1's test (high school dropout, high school diploma, some college, bachelor's degree, missing), dummies for each Rosenberg self-esteem quartile, dummies for each Rotter locus of control quartile, indicator for magazines, newspapers, library card in mother's house at age 14, and dummies mother's marriage date (not married, before first birth, within a year after first birth, missing date).

* $p < 0.05$, ** $p < 0.01$