Online Appendix: Public and Parental Investments, and Children's Skill Formation

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A Additional Results

Table A.1: Balancing Test Across Treatment Status by Parents' Education

	(1) All	(2) Parent Edu: High school/less	(3) Parent Edu: College/more
Pre-Trial Test	0.022	0.022	0.025
	(0.020)	(0.024)	(0.022)
Born in 2007	−0.075	0.244	−0.282*
	(0.113)	(0.173)	(0.164)
Born in 2008	−0.051	0.203	−0.231
	(0.124)	(0.178)	(0.168)
Born in 2009	−0.031	0.209	−0.206
	(0.124)	(0.182)	(0.178)
Born in 2010	−0.097	0.075	−0.235
	(0.160)	(0.200)	(0.209)
Male	−0.027	−0.051	−0.011
	(0.026)	(0.034)	(0.034)
Birth weight (kg)	−0.061**	−0.101**	−0.031
	(0.027)	(0.039)	(0.037)
Gestation (wks)	0.002	−0.010	0.005
	(0.009)	(0.012)	(0.012)
Apgar score	0.018	−0.001	0.027
	(0.021)	(0.032)	(0.024)
Number of Siblings	−0.019	−0.026	−0.020
	(0.020)	(0.028)	(0.022)
Mother weight (kg)	0.001	−0.000	0.002*
	(0.001)	(0.001)	(0.001)
Mother education (yrs)	−0.004	0.006	−0.001
	(0.008)	(0.016)	(0.009)
Mother age	0.004	0.010*	−0.001
	(0.004)	(0.006)	(0.005)
Mother employed	0.037	0.053	0.001
	(0.036)	(0.048)	(0.048)
Father education (yrs)	−0.003	−0.006	0.004
	(0.008)	(0.012)	(0.011)
Father age	−0.005*	−0.003	−0.006
	(0.003)	(0.005)	(0.004)
Father employed	−0.011	−0.023	0.031
	(0.052)	(0.062)	(0.061)
Household inc(1,000 USD)	0.000	−0.000	0.000
	(0.000)	(0.001)	(0.000)
Constant	0.601	0.952	0.468
	(0.471)	(0.652)	(0.580)
Observations	2,301	836	1,465

Note: The table shows results from regressing treatment status simultaneously on all covariates. Standard errors (in parentheses) are clustered at the preschool level. $^{*}p < 0.10$,$^{**}p < 0.05$,$^{***}p < 0.01$.

Table A.2: Joint Test of Balance by Treatment Status — Different Outcome Samples

	(1) Language Test Gr.2	(2) Math Test Gr.3	(3) Well-being Survey	(4) Parent Survey
Pre-Trial Test	0.028	0.034	0.014	0.024
	(0.021)	(0.023)	(0.024)	(0.022)
Born in 2007	−0.100	−0.036	0.024	−0.103
	(0.121)	(0.137)	(0.169)	(0.245)
Born in 2008	−0.090	−0.032	0.043	−0.079
	(0.129)	(0.144)	(0.167)	(0.258)
Born in 2009	−0.091	−0.041	0.018	−0.053
	(0.128)	(0.144)	(0.169)	(0.260)
Born in 2010	−0.174	−0.150	−0.064	−0.133
	(0.160)	(0.193)	(0.194)	(0.286)
Male	−0.046*	−0.036	−0.059*	−0.018
	(0.027)	(0.029)	(0.033)	(0.034)
Birth weight (kg)	−0.064**	−0.052*	−0.032	−0.043
	(0.026)	(0.031)	(0.033)	(0.035)
Gestation (wks)	0.003	0.001	−0.001	0.002
	(0.009)	(0.009)	(0.010)	(0.012)
Apgar score	0.028	0.043*	0.014	−0.001
	(0.021)	(0.024)	(0.024)	(0.028)
Number of Siblings	−0.019	−0.018	−0.042*	−0.015
	(0.021)	(0.022)	(0.021)	(0.026)
Mother weight (kg)	0.002*	0.002*	0.002*	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Mother education (yrs)	−0.001	−0.004	−0.004	−0.003
	(0.009)	(0.009)	(0.009)	(0.011)
Mother age	0.004	0.003	0.005	0.005
	(0.004)	(0.005)	(0.005)	(0.006)
Mother employed	0.020	0.027	0.015	0.005
	(0.036)	(0.039)	(0.040)	(0.048)
Father education (yrs)	−0.003	−0.005	−0.005	−0.005
	(0.008)	(0.009)	(0.010)	(0.010)
Father age	−0.005*	−0.006*	−0.004	−0.010***
	(0.003)	(0.003)	(0.004)	(0.004)
Father employed	−0.031	−0.023	−0.020	0.012
	(0.059)	(0.063)	(0.060)	(0.058)
Household inc(1,000 USD)	−0.000	−0.000	−0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.531	0.457	0.522	0.926
	(0.477)	(0.498)	(0.533)	(0.567)
Observations	1,898	1,635	1,339	1,338

Note: The table shows results from regressing treatment status simultaneously on all covariates for sub-samples with non-missing later outcomes (referenced in column headers). Standard errors (in parentheses) are clustered at the preschool level. $^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$.

Table A.3: Regressing Data Availability on Treatment Indicator

	(1)	(2)	(3)	(4)
Missing Language Score Gr.2	0.016			
	(0.060)			
Missing Math Score Gr.3		−0.002		
		(0.046)		
Missing Well-being Survey			0.042	
			(0.039)	
Missing Parent Survey				−0.035
				(0.031)
Constant	0.497***	0.501***	0.482***	0.515***
	(0.066)	(0.067)	(0.068)	(0.068)
Response Rate	0.825	0.711	0.582	0.581
Count Responses	1,898	1,635	1,339	1,338
Observations	2,301	2,301	2,301	2,301

Note: The table shows estimates from regressions of indicators for non-missing information in long-run language (column 1) and math tests (column 2), as well as for child response on the Danish well-being survey in grade 2 (column 3), and parents' survey response to our follow-up survey (column 4) on treatment status.

Table A.4: Test of Data Availability and Covariates

	(1) Language Test (Gr.2)	(2) Math (Grade 3)	(3) Well-being Survey	(4) Parent Survey
Treated × High school/less	0.013	−0.006	−0.017	0.001
	(0.030)	(0.028)	(0.039)	(0.043)
Treated × College/more	−0.025	−0.011	−0.059	0.043
	(0.041)	(0.036)	(0.046)	(0.034)
College/more	−0.025	−0.060**	0.023	0.061
	(0.030)	(0.029)	(0.040)	(0.041)
Pre-Trial Test	0.013	0.008	0.026**	0.039***
	(0.009)	(0.009)	(0.011)	(0.011)
Child age	0.018	0.019	−0.012	−0.023
	(0.017)	(0.021)	(0.024)	(0.021)
Born in 2007	−0.002	0.130	0.015	0.291**
	(0.083)	(0.104)	(0.115)	(0.134)
Born in 2008	0.005	0.145	−0.004	0.286**
	(0.085)	(0.100)	(0.112)	(0.135)
Born in 2009	−0.011	0.089	−0.058	0.262*
	(0.090)	(0.107)	(0.115)	(0.147)
Born in 2010	−0.029	−0.437***	−0.089	0.178
	(0.107)	(0.126)	(0.126)	(0.159)
Male	−0.015	0.005	−0.005	−0.025
	(0.016)	(0.015)	(0.022)	(0.020)
Birth weight (kg)	−0.009	−0.012	0.009	−0.015
	(0.019)	(0.021)	(0.027)	(0.026)
Gestation (wks)	0.003	0.003	0.002	0.006
	(0.005)	(0.006)	(0.008)	(0.008)
Apgar score	−0.008	−0.008	−0.021	0.018
	(0.015)	(0.019)	(0.019)	(0.018)
Number of Siblings	0.021**	0.009	0.026**	−0.016
	(0.009)	(0.010)	(0.012)	(0.012)
Mother weight (kg)	0.001	0.001	0.000	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Mother age	−0.007***	−0.005**	−0.002	0.003
	(0.002)	(0.003)	(0.003)	(0.003)
Mother employed	0.008	−0.005	0.051	0.071**
	(0.022)	(0.023)	(0.032)	(0.032)
Father age	0.000	0.001	−0.005**	−0.000
	(0.002)	(0.002)	(0.002)	(0.003)
Father employed	0.063*	0.029	0.007	0.132***
	(0.033)	(0.034)	(0.032)	(0.037)
Household inc(1,000 USD)	−0.000	0.000	−0.000	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.845***	0.623*	1.037**	−0.208
	(0.269)	(0.367)	(0.408)	(0.412)
Response Rate	0.825	0.711	0.582	0.581
Count Responses	1,898	1,635	1,339	1,338
Observations	2,301	2,301	2,301	2,301

Note: The table shows linear regressions of indicators for non-missing information in long-run language (column 1) and math tests (column 2), as well as for child response on the Danish well-being survey in grade 2 (column 3), and parents' survey response to our follow-up survey (column 4) on treatment status and covariates. Base level child birth cohort is 2006, only 16 children.

Table A.5: Main Treatment Effects: Full Results with Covariates

	Pre-Trial Test		Post-Trial Test		National Test Grade 2	
	(1)	(2)	(3)	(4)	(5)	(6)
	Pooled	By parent ed	Pooled	By parent ed	Pooled	By parent ed
Treated	0.084		0.309***		0.055	
	(0.271)		(0.000)		(0.468)	
Treated × High school/less		0.079		0.304***		0.222**
		(0.412)		(0.000)		(0.023)
Treated × College/more		0.091		0.311***		−0.039
		(0.311)		(0.000)		(0.606)
College/more		0.324***		0.075		0.483***
		(0.000)		(0.147)		(0.000)
Child age	−0.043	−0.046	−0.078*	−0.079*	0.033	0.035
	(0.358)	(0.329)	(0.056)	(0.051)	(0.562)	(0.545)
Born in 2007	0.242	0.185	−0.106	−0.120	0.130	0.059
	(0.261)	(0.388)	(0.430)	(0.398)	(0.559)	(0.795)
Born in 2008	−0.035	−0.091	−0.101	−0.116	0.224	0.162
	(0.875)	(0.682)	(0.467)	(0.425)	(0.313)	(0.485)
Born in 2009	−0.009	−0.069	−0.247	−0.263	0.290	0.221
	(0.966)	(0.747)	(0.163)	(0.147)	(0.255)	(0.403)
Born in 2010	0.130	0.062	−0.281	−0.301	0.349	0.281
	(0.569)	(0.785)	(0.170)	(0.147)	(0.239)	(0.360)
Male	−0.017	−0.020	0.009	0.009	−0.167***	−0.169***
	(0.656)	(0.604)	(0.776)	(0.779)	(0.000)	(0.000)
Birth weight (kg)	0.074	0.087*	0.074**	0.078**	0.099**	0.116**
	(0.133)	(0.090)	(0.044)	(0.037)	(0.032)	(0.011)
Gestation (wks)	0.013	0.012	−0.023*	−0.024*	−0.002	−0.002
	(0.460)	(0.520)	(0.091)	(0.087)	(0.894)	(0.930)
Apgar score	−0.013	−0.016	0.021	0.020	−0.032	−0.028
	(0.649)	(0.571)	(0.630)	(0.640)	(0.189)	(0.267)
Number of Siblings	−0.088***	−0.092***	−0.051**	−0.053**	0.032	0.031
	(0.002)	(0.001)	(0.040)	(0.035)	(0.215)	(0.219)
Mother weight (kg)	−0.001	−0.001	−0.000	−0.000	−0.002	−0.002
	(0.552)	(0.344)	(0.832)	(0.691)	(0.327)	(0.213)
Mother education (yrs)	0.059***		0.020**		0.058***	
	(0.000)		(0.021)		(0.000)	
Mother age	0.006	0.010*	0.002	0.003	0.015**	0.018***
	(0.276)	(0.089)	(0.745)	(0.541)	(0.016)	(0.009)
Mother employed	−0.007	0.031	0.048	0.064	0.058	0.088
	(0.915)	(0.661)	(0.316)	(0.174)	(0.407)	(0.210)
Father education (yrs)	0.038***		0.008		0.041***	
	(0.002)		(0.412)		(0.000)	
Father age	−0.004	−0.005	−0.002	−0.002	0.001	−0.001
	(0.418)	(0.297)	(0.634)	(0.595)	(0.901)	(0.879)
Father employed	0.043	0.058	−0.052	−0.048	0.046	0.076
	(0.500)	(0.346)	(0.366)	(0.407)	(0.536)	(0.311)
Household inc(1,000 USD)	0.000	0.001**	0.000	0.000	−0.000	−0.000
	(0.254)	(0.034)	(0.482)	(0.230)	(0.111)	(0.678)
Pre-Trial Test			0.452***	0.456***	0.219***	0.229***
			(0.000)	(0.000)	(0.000)	(0.000)
Constant	−1.686**	−0.560	1.453*	1.784**	−2.244**	−1.338
	(0.048)	(0.494)	(0.076)	(0.032)	(0.027)	(0.197)
Observations	2,301	2,301	2,301	2,301	1,898	1,898

Note: Full results for Table 4. Standard errors in parentheses, clustered at preschool level. *p-values* in parentheses. $^{*}p < 0.10, ^{**}p < 0.05, ^{***}p < 0.01$.

Table A.6: Treatment effects on Math and Social Skills: Full Results with Covariates

	Math	Well-being Survey		
	(1)	(2)	(3)	(4)
	Math (Grade 3)	General well-being	Social skills	Socio-em.distress
Treated × High school/less	0.181**	0.173*	−0.053	−0.325***
	(0.040)	(0.094)	(0.570)	(0.008)
Treated × College/more	−0.019	−0.071	0.056	−0.073
	(0.824)	(0.395)	(0.497)	(0.290)
College/more	0.624***	0.121	0.060	−0.231**
	(0.000)	(0.149)	(0.528)	(0.029)
Child age	0.143**	−0.079	0.033	−0.023
	(0.026)	(0.105)	(0.535)	(0.681)
Born in 2007	0.244	0.016	0.104	0.212
	(0.348)	(0.964)	(0.755)	(0.583)
Born in 2008	0.444	−0.202	0.059	0.252
	(0.109)	(0.581)	(0.853)	(0.519)
Born in 2009	0.685**	−0.180	0.127	0.167
	(0.016)	(0.627)	(0.693)	(0.678)
Born in 2010	0.611*	−0.400	0.109	0.093
	(0.076)	(0.297)	(0.755)	(0.827)
Male	0.043	−0.370***	0.237***	−0.064
	(0.312)	(0.000)	(0.000)	(0.254)
Birth weight (kg)	0.089	−0.059	0.052	−0.015
	(0.113)	(0.398)	(0.406)	(0.815)
Gestation (wks)	0.014	0.026	0.034*	−0.013
	(0.473)	(0.258)	(0.066)	(0.476)
Apgar score	−0.031	0.054	0.060	−0.069
	(0.451)	(0.167)	(0.228)	(0.169)
Number of Siblings	0.027	0.025	0.058*	−0.003
	(0.427)	(0.425)	(0.063)	(0.911)
Mother weight (kg)	−0.001	0.002	−0.000	−0.000
	(0.384)	(0.191)	(0.759)	(0.798)
Mother age	0.002	−0.015**	0.002	−0.005
	(0.768)	(0.041)	(0.756)	(0.547)
Mother employed	0.141*	0.219**	0.128	−0.041
	(0.070)	(0.015)	(0.123)	(0.567)
Father age	−0.003	0.002	0.004	0.003
	(0.585)	(0.710)	(0.468)	(0.616)
Father employed	0.034	−0.097	0.023	−0.070
	(0.690)	(0.228)	(0.843)	(0.504)
Household inc(1,000 USD)	0.001	0.001*	0.001**	−0.001**
	(0.111)	(0.092)	(0.033)	(0.020)
Constant	−2.700**	−0.310	−3.196***	1.826*
	(0.010)	(0.785)	(0.001)	(0.057)
Observations	1,635	1,339	1,339	1,339

Note: Full results for Table 5. P-values in parentheses, based on standard errors clustered at preschool level. P-values in parentheses. $^{*}p < 0.10, ^{**}p < 0.05, ^{***}p < 0.01$.

Table A.7: Treatment-Control Differences in Parental Investments: Full Results with Covariates

	(1) Reading Inv.	(2) Non-cog Inv.
Treated × High school/less	0.183*	0.195*
	(0.089)	(0.057)
Treated × College/more	0.100	−0.145*
	(0.232)	(0.072)
College/more	0.250***	0.037
	(0.006)	(0.716)
Child age	−0.110**	−0.062
	(0.042)	(0.262)
Born in 2007	−0.998***	−1.013***
	(0.000)	(0.000)
Born in 2008	−0.782***	−0.833***
	(0.000)	(0.000)
Born in 2009	−0.692***	−0.918***
	(0.002)	(0.000)
Born in 2010	−0.730***	−1.018***
	(0.008)	(0.000)
Male	0.019	0.090
	(0.732)	(0.111)
Birth weight (kg)	−0.176***	−0.145**
	(0.004)	(0.022)
Gestation (wks)	0.027	−0.008
	(0.234)	(0.669)
Apgar score	0.008	−0.024
	(0.864)	(0.581)
Number of Siblings	−0.072**	−0.019
	(0.047)	(0.669)
Mother weight (kg)	−0.001	0.003
	(0.725)	(0.103)
Mother age	0.011	−0.016**
	(0.184)	(0.030)
Mother employed	0.155	−0.198**
	(0.125)	(0.013)
Father age	0.006	0.009
	(0.292)	(0.227)
Father employed	0.023	0.191
	(0.825)	(0.133)
Household inc(1,000 USD)	−0.001**	−0.001
	(0.023)	(0.142)
Constant	0.328	2.542***
	(0.774)	(0.006)
Observations	1,338	1,338

Note: Full results for Table 6. P-values in parentheses, based on standard errors clustered at preschool level. $^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$.

Table A.8: Treatment-Control Differences in Parental Reading Investments: Split Factor

	(1) Inv: Time reading	(2) Inv: Enjoy reading
Treated × High school/less	0.157	0.068
	(0.131)	(0.123)
Treated × College/more	0.017	0.087
	(0.069)	(0.074)
College/more	0.115	0.255**
	(0.097)	(0.110)
Child age	−0.140***	−0.029
	(0.047)	(0.059)
Born in 2007	−1.429***	−0.070
	(0.221)	(0.121)
Born in 2008	−1.157***	−0.044
	(0.223)	(0.134)
Born in 2009	−1.044***	−0.086
	(0.237)	(0.162)
Born in 2010	−1.348***	0.174
	(0.280)	(0.214)
Male	0.018	0.039
	(0.053)	(0.057)
Birth weight (kg)	−0.161**	−0.097
	(0.069)	(0.063)
Gestation (wks)	0.013	0.021
	(0.025)	(0.020)
Apgar score	−0.044	0.056
	(0.038)	(0.057)
Number of Siblings	−0.034	−0.079**
	(0.042)	(0.037)
Mother weight (kg)	0.001	−0.001
	(0.002)	(0.002)
Mother age	−0.001	0.015**
	(0.009)	(0.007)
Mother employed	0.053	0.106
	(0.101)	(0.092)
Father age	0.011	−0.001
	(0.007)	(0.006)
Father employed	0.039	0.032
	(0.132)	(0.106)
Household inc(1,000 USD)	−0.001**	−0.000
	(0.000)	(0.000)
Constant	2.300**	−1.468
	(1.142)	(1.093)
Mean outcome	−0.009	0.024
Observations	1,338	1,338

Note: Regressing split version of the parental reading-investment factor on a treatment indicator interacted with parental education, similar to Table 6. Standard errors (in parentheses) are clustered at the preschool level. $^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$.

Table A.9: Heterogeneous Treatment Effects on Language Skills: Full Results with Covariates

	(1)	(2)
Treated × High school/less	0.232**	
	(0.021)	
Treated × College/more	−0.032	
	(0.681)	
Treated × School quality low		0.266
		(0.104)
Treated × School quality high		−0.015
		(0.850)
College/more	0.480***	
	(0.000)	
School quality high		0.336**
		(0.040)
Child age	0.041	0.013
	(0.485)	(0.821)
Born in 2007	0.064	0.123
	(0.778)	(0.607)
Born in 2008	0.191	0.215
	(0.407)	(0.367)
Born in 2009	0.241	0.272
	(0.359)	(0.314)
Born in 2010	0.289	0.290
	(0.348)	(0.348)
Male	−0.175***	−0.163***
	(0.000)	(0.000)
Birth weight (kg)	0.109**	0.103**
	(0.013)	(0.021)
Gestation (wks)	−0.005	−0.002
	(0.786)	(0.919)
Apgar score	−0.031	−0.034
	(0.223)	(0.135)
Number of Siblings	0.031	0.026
	(0.244)	(0.342)
Mother weight (kg)	−0.002	−0.002
	(0.259)	(0.161)
Mother age	0.018***	0.023***
	(0.007)	(0.001)
Mother employed	0.098	0.138*
	(0.161)	(0.051)
Father age	−0.001	0.001
	(0.879)	(0.853)
Father employed	0.075	0.095
	(0.321)	(0.238)
Household inc(1,000 USD)	−0.000	0.000
	(0.814)	(0.431)
Pre-Trial Test	0.232***	0.256***
	(0.000)	(0.000)
Constant	−1.238	−1.414
	(0.251)	(0.195)
Observations	1,841	1,841

Note: Full results for Table 7. P-values in parentheses, based on standard errors clustered at preschool level. $^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$.

Table A.10: Heterogeneous Treatment Effects by School Quality (Test Scores): Full Results with Covariates

	(1) Language Test (Gr.2)	(2) Reading Inv.	(3) Non-cog Inv.
Treated × High school/less × School quality low	0.332***	0.497***	0.282
	(0.009)	(0.009)	(0.116)
Treated × High school/less × School quality high	0.176	0.043	0.061
	(0.161)	(0.759)	(0.644)
Treated × College/more × School quality low	0.190	0.019	0.028
	(0.457)	(0.897)	(0.872)
Treated × College/more × School quality high	−0.085	0.075	−0.234**
	(0.234)	(0.485)	(0.023)
High school/less × School quality low	0.000	0.000	0.000
	(.)	(.)	(.)
High school/less × School quality high	0.146	0.277*	0.270
	(0.298)	(0.066)	(0.148)
College/more × School quality low	0.268	0.414***	0.187
	(0.100)	(0.006)	(0.313)
College/more × School quality high	0.649***	0.462***	0.180
	(0.000)	(0.003)	(0.276)
Child age	0.036	−0.075	−0.052
	(0.537)	(0.197)	(0.422)
Born in 2007	0.057	−1.006***	−0.940***
	(0.799)	(0.000)	(0.000)
Born in 2008	0.178	−0.784***	−0.805***
	(0.430)	(0.004)	(0.001)
Born in 2009	0.233	−0.634**	−0.843***
	(0.368)	(0.019)	(0.001)
Born in 2010	0.273	−0.654**	−0.960***
	(0.365)	(0.044)	(0.002)
Male	−0.171***	−0.002	0.008
	(0.000)	(0.980)	(0.880)
Birth weight (kg)	0.107**	−0.164**	−0.101
	(0.015)	(0.015)	(0.148)
Gestation (wks)	−0.006	0.018	−0.008
	(0.751)	(0.468)	(0.683)
Apgar score	−0.033	−0.000	−0.046
	(0.182)	(0.996)	(0.269)
Number of Siblings	0.032	−0.064	−0.016
	(0.225)	(0.105)	(0.735)
Mother weight (kg)	−0.001	−0.001	0.002
	(0.338)	(0.793)	(0.319)
Mother age	0.017**	0.007	−0.018**
	(0.014)	(0.495)	(0.019)
Mother employed	0.099	0.116	−0.133
	(0.147)	(0.284)	(0.139)
Father age	−0.000	0.005	0.012
	(0.993)	(0.472)	(0.137)
Father employed	0.073	−0.043	0.171
	(0.332)	(0.702)	(0.200)
Household inc(1,000 USD)	−0.000	−0.001*	−0.001*
	(0.437)	(0.075)	(0.093)
Pre-Trial Test	0.234***		
	(0.000)		
Constant	−1.218	0.438	2.419**
	(0.258)	(0.728)	(0.016)
Observations	1,841	1,129	1,129

Note: Full results for Table 8. P-values in parentheses, based on standard errors clustered at preschool level. $^{*}p < 0.10$,** $p < 0.05$,*** $p < 0.01$.

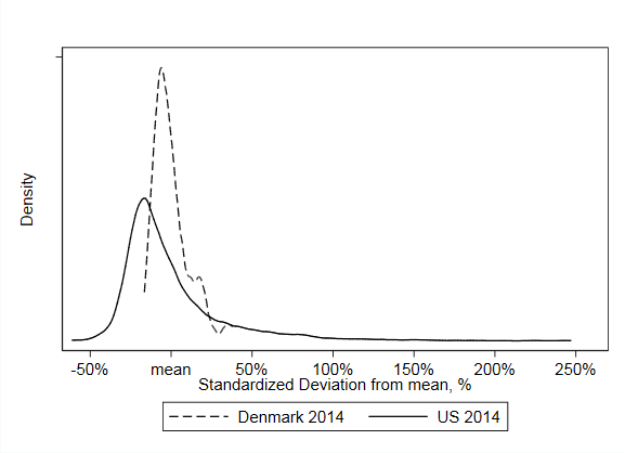
Table A.11: p-values of one-sided tests of hypothesis comparing treatment effects

	Treatment Effects on Language Test Scores $\frac{d\theta_2}{d\theta_1}$		
	$\theta_P^{low}, \underline{G}_2^{high}$	$\theta_P^{high}, \underline{G}_2^{low}$	$\theta_P^{high}, \underline{G}_2^{high}$
$\theta_P^{low}, \underline{G}_2^{low}$	.189	.268	.003
$\theta_P^{low}, \underline{G}_2^{high}$		.520	.011
$\theta_P^{high}, \underline{G}_2^{low}$			.150
	Treatment Effects on Reading Investments $\frac{\partial x_2}{\partial \theta_1}$		
	$\theta_P^{low}, \underline{G}_2^{high}$	$\theta_P^{high}, \underline{G}_2^{low}$	$\theta_P^{high}, \underline{G}_2^{high}$
$\theta_P^{low}, \underline{G}_2^{low}$	.030	.078	.038
$\theta_P^{low}, \underline{G}_2^{high}$		.587	.630
$\theta_P^{high}, \underline{G}_2^{low}$			.506
	Treatment Effects on Non-cognitive Investments $\frac{\partial x_2}{\partial \theta_1}$		
	$\theta_P^{low}, \underline{G}_2^{high}$	$\theta_P^{high}, \underline{G}_2^{low}$	$\theta_P^{high}, \underline{G}_2^{high}$
$\theta_P^{low}, \underline{G}_2^{low}$	.201	.228	.004
$\theta_P^{low}, \underline{G}_2^{high}$		.489	.017
$\theta_P^{high}, \underline{G}_2^{low}$			.045

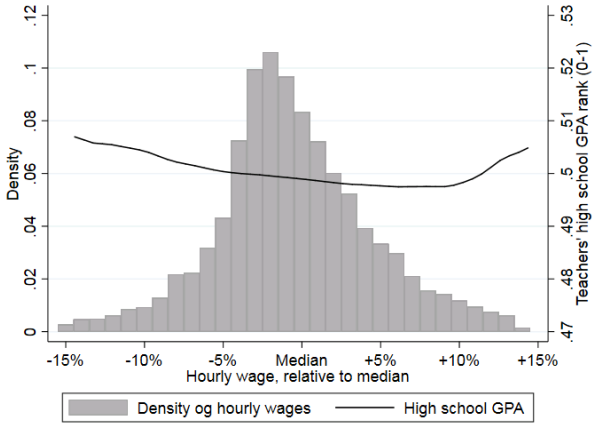
Note: These p-values compare treatment effects in Table 8 to each other. The tests performed are of the direction *row*→*column*. For example, the p-value of .077 in the top left cell corresponds to a test of H_0 : Treatment effect in $\theta_P^{low}, \underline{G}_2^{low}$ > Treatment effect in $\theta_P^{low}, \underline{G}_2^{high}$.

Figure A.1: Average Public School Expenditures in Denmark and the U.S.

a) Average school expenditure



b) Teachers' hourly wages



Note: Figure a) shows average school expenditures per student in public schools in 2014 relative the to the country average. Source: Denmark: www.statistikbanken.dk (Statistics Denmark); U.S.: Annual Survey of School System Finances; https://catalog.data.gov/dataset/annual-survey-of-school-system-finances. Figure b) shows the distribution of teachers' hourly wage rates in 2014 as a percentage deviation from the median wage rate. The figure also presents the association between teachers' rank of high school GPA and hourly wages (note that the y-axis only span from 0.47–0.53; $corr(wage, testscore) = -0.03$, with $p = 0.73$ for H_0 that $corr = 0$ and H_A that $corr \neq 0$). Hourly wage rates are adjusted for years of experience to remove variation stemming from the wage-progression at different levels of experience set by collective bargaining. This adjustment involves some measurement error, as it uses *years since graduation* and not *years of employment as a teacher in a Danish municipality*. Also, the hourly wage rates are not adjusted for the roughly 5% wage differences across regions (a PPP adjustment).

Table A.12: Heterogeneous Treatment Effects — Comparing School Quality Measures

	(1) School Quality Based on Average Test Scores (as Table 8)	(2) School Quality Based on Average Teacher Characteristics
Treated × High school/less × School quality low	0.332***	0.403**
	(0.124)	(0.166)
Treated × High school/less × School quality high	0.176	0.126
	(0.124)	(0.120)
Treated × College/more × School quality low	0.190	0.399
	(0.254)	(0.248)
Treated × College/more × School quality high	−0.085	−0.164**
	(0.071)	(0.065)
High school/less × School quality low	0.000	0.000
	(.)	(.)
High school/less × School quality high	0.146	0.173
	(0.140)	(0.145)
College/more × School quality low	0.268	0.290*
	(0.161)	(0.149)
College/more × School quality high	0.649***	0.671***
	(0.131)	(0.126)
Covariates	X	X
Observations	1,841	1,692

Note: Showing results from regressions of language test scores in grade 2 on the interaction of treatment status × parental education × school quality, where school quality is measured as in the main text (column 1), and with the alternative measure using predicted test scores based on average teacher characteristics at each school (column 2). More details on the quality definition in Section C.4. Covariates included as in Table 8, including pre-intervention test scores.

Table A.13: Heterogeneous Treatment Effects — Comparing Realized to Default School

	(1) Realized School Quality Based on Test Scores (as Table 8)	(2) Default School Quality Based on Test Scores
Treated × High school/less × School quality low	0.332***	0.411***
	(0.124)	(0.110)
Treated × High school/less × School quality high	0.176	0.111
	(0.124)	(0.120)
Treated × College/more × School quality low	0.190	0.164
	(0.254)	(0.243)
Treated × College/more × School quality high	−0.085	−0.087
	(0.071)	(0.070)
High school/less × School quality low	0.000	0.000
	(.)	(.)
High school/less × School quality high	0.146	0.235*
	(0.140)	(0.141)
College/more × School quality low	0.268	0.366**
	(0.161)	(0.175)
College/more × School quality high	0.649***	0.691***
	(0.131)	(0.118)
Covariates	X	X
Observations	1,841	1,898

Note: Showing results from regressions of language test scores in grade 2 on the interaction of treatment status × parental education × school quality, where we contrast the realized school (column 1) as in the main text to the default school (column 2). Default school is the elementary school attended by the majority of children at each given preschool. School quality is measured as in the main text with average test scores. Covariates included as in Table 8, including pre-intervention test scores.

A.1 Results not conditioning on covariates

Table A.14: Baseline balancing, short-run, and longer-run treatment effects — Not conditioning on covariates

	Pre-Trial Test		Post-Trial Test		Language Test Grade 2	
	(1)	(2)	(3)	(4)	(5)	(6)
	Pooled	By parent ed	Pooled	By parent ed	Pooled	By parent ed
Treated	0.073		0.345***		0.055	
	(0.088)		(0.084)		(0.089)	
Treated × High school/less		0.080		0.351***		0.253**
		(0.094)		(0.089)		(0.097)
Treated × College/more		0.089		0.357***		−0.033
		(0.094)		(0.092)		(0.074)
College/more		0.419***		0.300***		0.661***
		(0.068)		(0.066)		(0.073)
Constant	0.002	−0.271***	0.475***	0.279***	0.129*	−0.295***
	(0.062)	(0.065)	(0.060)	(0.062)	(0.074)	(0.077)
Parental Education	-	-	-	-	-	-
Pre-test	-	-	-	-	-	-
Covariates	-	-	-	-	-	-
Observations	2,301	2,301	2,301	2,301	1,898	1,898

Note: Similar to Table 4, but not including covariates. Regression estimates of the treatment–control differences (β_t) in test scores y_{it} from $y_{it} = \alpha + \beta_t T_i + \varepsilon_{it}$. Standard errors (in parentheses) are clustered at the preschool level. $^{*}p < 0.10$,** $p < 0.05$,*** $p < 0.01$. Main analysis sample excluding children with no immigration background. No other covariates included.

Table A.15: Treatment effects — Not conditioning on Pre-Intervention Test Scores

	Post-Trial Test		Language Test Grade 2	
	(1)	(2)	(3)	(4)
	Pooled	By parent ed	Pooled	By parent ed
Treated	0.347***		0.078	
	(0.000)		(0.277)	
Treated × High school/less		0.340***		0.250***
		(0.000)		(0.008)
Treated × College/more		0.353***		−0.017
		(0.000)		(0.824)
College/more		0.223***		0.558***
		(0.001)		(0.000)
Child age	−0.097**	−0.100**	0.018	0.019
	(0.035)	(0.033)	(0.746)	(0.748)
Born in 2007	0.004	−0.036	0.212	0.136
	(0.981)	(0.833)	(0.377)	(0.585)
Born in 2008	−0.117	−0.157	0.247	0.176
	(0.455)	(0.342)	(0.300)	(0.487)
Born in 2009	−0.251	−0.295	0.310	0.229
	(0.171)	(0.122)	(0.239)	(0.408)
Born in 2010	−0.222	−0.273	0.414	0.333
	(0.292)	(0.206)	(0.172)	(0.293)
Male	0.002	0.000	−0.171***	−0.174***
	(0.965)	(0.993)	(0.000)	(0.000)
Birth weight (kg)	0.108**	0.118**	0.114**	0.135***
	(0.015)	(0.010)	(0.015)	(0.004)
Gestation (wks)	−0.017	−0.018	0.001	0.002
	(0.251)	(0.235)	(0.949)	(0.909)
Apgar score	0.015	0.012	−0.034	−0.031
	(0.743)	(0.778)	(0.167)	(0.246)
Number of Siblings	−0.091***	−0.095***	0.009	0.006
	(0.003)	(0.002)	(0.742)	(0.825)
Mother weight (kg)	−0.001	−0.001	−0.002	−0.002
	(0.649)	(0.436)	(0.286)	(0.161)
Mother education (yrs)	0.047***		0.072***	
	(0.000)		(0.000)	
Mother age	0.004	0.008	0.017***	0.020***
	(0.438)	(0.187)	(0.010)	(0.004)
Mother employed	0.044	0.078	0.055	0.095
	(0.446)	(0.185)	(0.443)	(0.189)
Father education (yrs)	0.025**		0.048***	
	(0.026)		(0.000)	
Father age	−0.004	−0.005	−0.000	−0.002
	(0.443)	(0.362)	(0.951)	(0.696)
Father employed	−0.033	−0.021	0.047	0.082
	(0.595)	(0.728)	(0.540)	(0.277)
Household inc(1,000 USD)	0.000	0.001*	−0.000	0.000
	(0.240)	(0.051)	(0.212)	(0.752)
Constant	0.692	1.529*	−2.612**	−1.483
	(0.442)	(0.090)	(0.012)	(0.166)
Observations	2,301	2,301	1,898	1,898

Note: Similar to Table 4, but not including pre-test scores. Regression estimates of the treatment–control differences (β_t) in test scores y_{it} from $y_{it} = \alpha + \beta_t T_i + \varepsilon_{it}$. Standard errors (in parentheses) are clustered at the preschool level. $^{*}p < 0.10$,** $p < 0.05$,*** $p < 0.01$. Main analysis sample excluding children with no immigration background. No other covariates included.

Table A.16: Treatment-Control Differences in Math and Social Skills — Not conditioning on covariates

	Math	Well-being Survey		
	(1) Math (Grade 3)	(2) General well-being	(3) Social skills	(4) Socio-em.distress
Treated × High school/less	0.159*	0.228**	−0.080	−0.308**
	(0.088)	(0.112)	(0.092)	(0.125)
Treated × College/more	−0.034	−0.049	0.039	−0.073
	(0.086)	(0.084)	(0.086)	(0.068)
College/more	0.681***	0.154*	0.169*	−0.306***
	(0.063)	(0.085)	(0.089)	(0.109)
Constant	−0.337***	−0.167*	−0.083	0.293***
	(0.063)	(0.096)	(0.073)	(0.106)
Covariates	-	-	-	-
Observations	1,635	1,339	1,339	1,339

Note: Similar to Table 5, but not including covariates. Regressing children's outcomes on treatment status and parental educational attainment. Main analysis sample excluding children with an immigration background. A higher Socio-emotional distress score indicates a worse outcome. Standard errors (in parentheses) are clustered at the preschool level. $^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$.

Table A.17: Treatment–control Differences in Investments — Not conditioning on covariates

	(1) Reading Inv.	(2) Non-cog Inv.
Treated × High school/less	0.188	0.186*
	(0.115)	(0.107)
Treated × College/more	0.120	−0.122
	(0.093)	(0.079)
College/more	0.267***	−0.057
	(0.090)	(0.099)
Constant	−0.243***	0.024
	(0.085)	(0.081)
Covariates	-	-
Observations	1,338	1,338

Note: Similar to Table 6, but not including covariates. Standard errors (in parentheses) clustered at preschool level. $^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$.

Table A.18: Heterogeneous Treatment Effects by School Quality (Test Scores) — Not conditioning on covariates

	(1) Language Test (Gr.2)	(2) Reading Inv.	(3) Non-cog Inv.
Treated × High school/less × School quality low	0.316**	0.471**	0.215
	(0.128)	(0.211)	(0.172)
Treated × High school/less × School quality high	0.247**	0.070	0.062
	(0.119)	(0.146)	(0.136)
Treated × College/more × School quality low	0.151	−0.006	0.030
	(0.258)	(0.155)	(0.184)
Treated × College/more × School quality high	−0.066	0.089	−0.212**
	(0.066)	(0.116)	(0.100)
High school/less × School quality low	0.000	0.000	0.000
	(.)	(.)	(.)
High school/less × School quality high	0.112	0.264	0.245
	(0.127)	(0.166)	(0.181)
College/more × School quality low	0.407**	0.470***	0.136
	(0.177)	(0.138)	(0.173)
College/more × School quality high	0.809***	0.464***	0.058
	(0.117)	(0.156)	(0.163)
Covariates	-	-	-
Observations	1,841	1,129	1,129

Note: Similar to Table A.10, but not including covariates. Standard errors (in parentheses) clustered at preschool level. $^{*}p < 0.10$,** $p < 0.05$,*** $p < 0.01$.

A.2 Results on Full Sample, Including Children with Immigration Background

The following results replicate figures and tables from the main text, but they are run on the full sample of children (including those with an immigration background). The school quality measure is based on average test scores, as in the main text.

Table A.19: Number of Observations in different Treatment/Education/School Quality Groups — Children with Immigration Background Only

	(1) Full Sample	(2) Cond'l on Lang.Test Gr 2	(3) Cond'l on Lang Gr 2& Parent Survey
Control, Low ed, Low def. school qual	48	38	7
Control, Low ed, High def. school qual	11	10	3
Control, High ed, Low def. school qual	23	14	4
Control, High ed, High def. school qual	11	6	2
Treatment, Low ed, Low def. school qual	29	26	8
Treatment, Low ed, High def. school qual	17	15	7
Treatment, High ed, Low def. school qual	9	7	2
Treatment, High ed, High def. school qual	18	15	12
Total	166	131	45

Note: This table is equivalent to Table A.19, showing the added observations that are now present in the full sample that does not exclude children with an immigrant background.

Table A.20: Balancing of estimation sample by treatment — Including Children with Immigration Background

	(1) General Pop	(2) Control Avg.	(3) Treated Avg.	(4) Diff Treat-Control
Pre-Trial Test		0.039	-0.038	0.076
		(1.032)	(1.007)	(0.085)
Child Age at pre-trial test		4.047	4.098	-0.052
		(0.849)	(0.854)	(0.042)
Born in 2007	0.251	0.171	0.187	-0.017
	(0.434)	(0.376)	(0.390)	(0.045)
Born in 2008	0.255	0.335	0.332	0.003
	(0.436)	(0.472)	(0.471)	(0.024)
Born in 2009	0.246	0.330	0.301	0.029
	(0.431)	(0.470)	(0.459)	(0.022)
Born in 2010	0.247	0.154	0.171	-0.016
	(0.431)	(0.361)	(0.376)	(0.041)
Male	0.514	0.501	0.533	-0.033
	(0.500)	(0.500)	(0.499)	(0.025)
Birth weight (kg)	3.470	3.455	3.509	-0.053**
	(0.602)	(0.525)	(0.482)	(0.023)
Gestation (wks)	39.623	39.696	39.760	-0.064
	(1.938)	(1.583)	(1.563)	(0.076)
Apgar score	9.865	9.883	9.858	0.026
	(0.617)	(0.576)	(0.576)	(0.027)
Number of Siblings	1.450	1.340	1.444	-0.104*
	(0.954)	(0.810)	(0.941)	(0.059)
Mother weight (kg)	67.053	67.335	66.378	0.957
	(44.434)	(15.835)	(16.653)	(1.199)
Mother education (yrs)	13.762	14.036	13.994	0.042
	(2.635)	(2.487)	(2.714)	(0.315)
Mother age	38.941	39.747	39.823	-0.076
	(5.172)	(5.028)	(5.092)	(0.527)
Mother employed	0.729	0.831	0.797	0.034
	(0.445)	(0.375)	(0.402)	(0.030)
Father education (yrs)	13.558	13.777	13.833	-0.056
	(2.554)	(2.518)	(2.480)	(0.298)
Father age	41.590	42.025	42.580	-0.555
	(5.942)	(5.679)	(6.131)	(0.490)
Father employed	0.839	0.886	0.877	0.010
	(0.367)	(0.317)	(0.329)	(0.024)
Household inc(1,000 USD)	83.281	96.660	95.733	0.927
	(59.652)	(61.446)	(72.081)	(8.358)
School Quality	0.629	0.625	0.632	-0.007
	(0.252)	(0.247)	(0.259)	(0.055)
School Quality (Teacher Characteristics)	0.497	0.494	0.502	-0.009
	(0.318)	(0.317)	(0.320)	(0.073)
Observations	267,851	1,243	1,224	2,467

Note: The table shows descriptive statistics for all children in Denmark in the same birth cohorts as the paper's sample (column 1), the control group (column 2), and the treatment group (column 3). Average treatment-control differences are shown in column 4. Standard deviations of the variables are shown in parentheses for columns 1-3, standard errors clustered at institution level for column 4. The general population (column 1) consists of all children born in 2007-2010. $^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$. Note that the number of observations is only 2,186 for the 2 rows on school quality.

Table A.21: Treatment Effects Language Test Scores — Including Children with Immigrant Background

	Pre-Trial Test		Post-Trial Test		National Test Grade 2	
	(1)	(2)	(3)	(4)	(5)	(6)
	Pre-Trial Test	Pre-Trial Test	Post-Trial Test	Post-Trial Test	Language Test (Gr.2)	Language Test (Gr.2)
Treated	0.071		0.308***		0.048	
	(0.337)		(0.000)		(0.506)	
Treated × High school/less		0.057		0.294***		0.193**
		(0.528)		(0.000)		(0.037)
Treated × College/more		0.089		0.318***		−0.035
		(0.322)		(0.000)		(0.641)
College/more		0.314***		0.064		0.467***
		(0.000)		(0.194)		(0.000)
Child age	−0.044	−0.044	−0.069*	−0.070*	0.033	0.038
	(0.337)	(0.335)	(0.071)	(0.071)	(0.544)	(0.498)
Born in 2007	0.051	−0.001	−0.142	−0.151	0.147	0.090
	(0.848)	(0.997)	(0.224)	(0.213)	(0.415)	(0.625)
Born in 2008	−0.201	−0.247	−0.120	−0.128	0.228	0.185
	(0.464)	(0.338)	(0.325)	(0.307)	(0.219)	(0.337)
Born in 2009	−0.198	−0.250	−0.252	−0.261	0.315	0.264
	(0.468)	(0.330)	(0.111)	(0.102)	(0.147)	(0.243)
Born in 2010	−0.046	−0.102	−0.291	−0.304	0.369	0.319
	(0.873)	(0.708)	(0.125)	(0.112)	(0.157)	(0.238)
Male	−0.016	−0.017	0.016	0.016	−0.186***	−0.186***
	(0.688)	(0.652)	(0.631)	(0.636)	(0.000)	(0.000)
Birth weight (kg)	0.080*	0.090*	0.057	0.060	0.105**	0.119**
	(0.089)	(0.065)	(0.133)	(0.124)	(0.027)	(0.011)
Gestation (wks)	0.008	0.007	−0.020	−0.021	−0.009	−0.008
	(0.622)	(0.680)	(0.141)	(0.136)	(0.619)	(0.659)
Apgar score	−0.022	−0.025	0.014	0.014	−0.032	−0.029
	(0.464)	(0.399)	(0.739)	(0.749)	(0.182)	(0.242)
Number of Siblings	−0.068**	−0.076***	−0.049**	−0.051**	0.030	0.023
	(0.012)	(0.005)	(0.046)	(0.035)	(0.220)	(0.344)
Mother weight (kg)	−0.000	−0.001	0.000	−0.000	−0.002	−0.003*
	(0.755)	(0.506)	(0.956)	(0.909)	(0.134)	(0.079)
Mother education (yrs)	0.054***		0.017**		0.057***	
	(0.000)		(0.043)		(0.000)	
Mother age	0.011**	0.014***	0.001	0.002	0.016**	0.017***
	(0.034)	(0.010)	(0.822)	(0.658)	(0.013)	(0.010)
Mother employed	−0.008	0.027	0.045	0.058	0.041	0.071
	(0.894)	(0.679)	(0.289)	(0.162)	(0.556)	(0.307)
Father education (yrs)	0.042***		0.009		0.040***	
	(0.000)		(0.341)		(0.000)	
Father age	−0.006	−0.008*	−0.001	−0.001	−0.002	−0.003
	(0.119)	(0.072)	(0.770)	(0.719)	(0.773)	(0.589)
Father employed	0.008	0.030	−0.045	−0.039	0.063	0.097
	(0.900)	(0.618)	(0.406)	(0.465)	(0.316)	(0.110)
Household inc(1,000 USD)	0.001	0.001**	0.000	0.000	−0.000	−0.000
	(0.180)	(0.017)	(0.311)	(0.142)	(0.162)	(0.911)
Immigrant Background	−0.292***	−0.328***	−0.076	−0.086	−0.027	−0.050
	(0.001)	(0.000)	(0.305)	(0.242)	(0.821)	(0.695)
Pre-Trial Test			0.451***	0.455***	0.218***	0.229***
			(0.000)	(0.000)	(0.000)	(0.000)
Constant	−1.356	−0.229	1.379*	1.685**	−1.852*	−0.936
	(0.101)	(0.775)	(0.079)	(0.035)	(0.055)	(0.345)
Observations	2,465	2,465	2,465	2,465	2,028	2,028

Note: Regression similar to Table 4 and Table A.5, but on sample including children with immigration background. P-values in parentheses, based on standard errors clustered at preschool level. $^{*}p < 0.10, ^{**}p < 0.05, ^{***}p < 0.01$.

Table A.22: Treatment Effects, Testing Interaction with Immigrant Background

	Pre-Trial Test		Post-Trial Test		National Test Grade 2	
	(1)	(2)	(3)	(4)	(5)	(6)
	Pre-Trial Test	Pre-Trial Test	Post-Trial Test	Post-Trial Test	Language Test (Gr.2)	Language Test (Gr.2)
Treated	0.084		0.309***		0.056	
	(0.270)		(0.000)		(0.468)	
Treated × Immigrant Background	−0.195		−0.012		−0.111	
	(0.244)		(0.937)		(0.634)	
Treated × High school/less		0.079		0.305***		0.223**
		(0.411)		(0.000)		(0.023)
Treated × College/more		0.091		0.311***		−0.040
		(0.314)		(0.000)		(0.603)
Treated × High school/less × Immigrant Background		−0.205		−0.098		−0.267
		(0.314)		(0.566)		(0.338)
Treated × College/more × Immigrant Background		−0.051		0.188		0.150
		(0.854)		(0.370)		(0.626)
Immigrant Background	−0.202**	−0.254**	−0.071	−0.027	0.028	0.081
	(0.022)	(0.046)	(0.422)	(0.817)	(0.850)	(0.640)
College/more × Immigrant Background		−0.017		−0.170		−0.217
		(0.937)		(0.286)		(0.328)
College/more		0.321***		0.078		0.487***
		(0.000)		(0.133)		(0.000)
Child age	−0.042	−0.044	−0.069*	−0.070*	0.034	0.040
	(0.361)	(0.348)	(0.071)	(0.069)	(0.535)	(0.484)
Born in 2007	0.063	0.003	−0.142	−0.151	0.152	0.092
	(0.815)	(0.991)	(0.216)	(0.200)	(0.405)	(0.627)
Born in 2008	−0.187	−0.241	−0.120	−0.127	0.235	0.191
	(0.493)	(0.346)	(0.318)	(0.292)	(0.209)	(0.331)
Born in 2009	−0.184	−0.244	−0.251	−0.262*	0.322	0.269
	(0.498)	(0.338)	(0.107)	(0.095)	(0.143)	(0.241)
Born in 2010	−0.028	−0.094	−0.290	−0.303	0.378	0.330
	(0.922)	(0.730)	(0.121)	(0.104)	(0.152)	(0.233)
Male	−0.016	−0.017	0.016	0.015	−0.186***	−0.187***
	(0.685)	(0.648)	(0.631)	(0.659)	(0.000)	(0.000)
Birth weight (kg)	0.080*	0.091*	0.057	0.060	0.105**	0.120**
	(0.090)	(0.065)	(0.134)	(0.126)	(0.026)	(0.011)
Gestation (wks)	0.008	0.007	−0.020	−0.020	−0.009	−0.008
	(0.625)	(0.678)	(0.141)	(0.140)	(0.617)	(0.663)
Apgar score	−0.021	−0.024	0.014	0.014	−0.031	−0.028
	(0.472)	(0.408)	(0.739)	(0.741)	(0.186)	(0.260)
Number of Siblings	−0.070***	−0.077***	−0.049**	−0.049**	0.030	0.024
	(0.010)	(0.005)	(0.045)	(0.045)	(0.227)	(0.312)
Mother weight (kg)	−0.000	−0.001	0.000	−0.000	−0.002	−0.003*
	(0.749)	(0.507)	(0.957)	(0.950)	(0.133)	(0.081)
Mother education (yrs)	0.055***		0.017**		0.058***	
	(0.000)		(0.043)		(0.000)	
Mother age	0.012**	0.015***	0.001	0.002	0.016**	0.017***
	(0.033)	(0.009)	(0.821)	(0.665)	(0.012)	(0.010)
Mother employed	−0.006	0.030	0.045	0.058	0.042	0.072
	(0.929)	(0.647)	(0.289)	(0.172)	(0.542)	(0.303)
Father education (yrs)	0.042***		0.009		0.040***	
	(0.000)		(0.343)		(0.000)	
Father age	−0.007	−0.008*	−0.001	−0.002	−0.002	−0.003
	(0.105)	(0.067)	(0.768)	(0.713)	(0.757)	(0.571)
Father employed	0.010	0.030	−0.045	−0.040	0.066	0.098
	(0.869)	(0.602)	(0.412)	(0.466)	(0.307)	(0.118)
Household inc(1,000 USD)	0.001	0.001**	0.000	0.000	−0.000	−0.000
	(0.181)	(0.017)	(0.311)	(0.145)	(0.159)	(0.914)
Pre-Trial Test			0.451***	0.455***	0.218***	0.229***
			(0.000)	(0.000)	(0.000)	(0.000)
Constant	−1.392*	−0.258	1.377*	1.669**	−1.874*	−0.986
	(0.091)	(0.747)	(0.080)	(0.036)	(0.055)	(0.325)
Observations	2,465	2,465	2,465	2,465	2,028	2,028

Note: Testing whether treatment effects are different for children with an immigration background. See Table A.21. P-values in parentheses, based on standard errors clustered at preschool level. $^{*}p < 0.10, ^{**}p < 0.05, ^{***}p < 0.01$.

Table A.23: Treatment effects on Math and Social Skills — Including Children with Immigrant Background

	Math	Well-being Survey		
	(1)	(2)	(3)	(4)
	Math (Grade 3)	General well-being	Social skills	Socio-em.distress
Treated × High school/less	0.176**	0.125	−0.052	−0.250**
	(0.025)	(0.225)	(0.549)	(0.028)
Treated × College/more	−0.015	−0.062	0.053	−0.069
	(0.859)	(0.445)	(0.507)	(0.310)
College/more	0.611***	0.085	0.064	−0.174*
	(0.000)	(0.285)	(0.465)	(0.086)
Child age	0.128**	−0.091*	0.014	−0.013
	(0.031)	(0.075)	(0.772)	(0.815)
Born in 2007	0.273	0.160	−0.095	0.122
	(0.224)	(0.535)	(0.767)	(0.706)
Born in 2008	0.461*	−0.047	−0.166	0.156
	(0.057)	(0.866)	(0.592)	(0.638)
Born in 2009	0.673***	−0.056	−0.116	0.073
	(0.008)	(0.848)	(0.712)	(0.835)
Born in 2010	0.625**	−0.279	−0.147	0.027
	(0.049)	(0.378)	(0.662)	(0.943)
Male	0.029	−0.384***	0.246***	−0.064
	(0.477)	(0.000)	(0.000)	(0.241)
Birth weight (kg)	0.096*	−0.089	0.062	0.004
	(0.082)	(0.188)	(0.325)	(0.945)
Gestation (wks)	0.004	0.027	0.035*	−0.018
	(0.841)	(0.260)	(0.058)	(0.277)
Apgar score	−0.032	0.047	0.057	−0.056
	(0.426)	(0.216)	(0.241)	(0.269)
Number of Siblings	0.022	0.023	0.046*	−0.009
	(0.464)	(0.431)	(0.090)	(0.716)
Mother weight (kg)	−0.001	0.002	−0.001	−0.000
	(0.411)	(0.297)	(0.503)	(0.827)
Mother age	0.001	−0.013*	0.002	−0.007
	(0.840)	(0.082)	(0.715)	(0.425)
Mother employed	0.148**	0.135	0.119	−0.032
	(0.046)	(0.111)	(0.106)	(0.611)
Father age	−0.003	0.003	0.003	0.001
	(0.597)	(0.637)	(0.607)	(0.873)
Father employed	0.057	−0.093	0.070	0.011
	(0.436)	(0.272)	(0.499)	(0.908)
Household inc(1,000 USD)	0.001**	0.001*	0.001**	−0.001***
	(0.036)	(0.096)	(0.014)	(0.009)
Constant	−2.216**	−0.133	−2.798***	1.905**
	(0.029)	(0.908)	(0.002)	(0.048)
Observations	1,753	1,424	1,424	1,424

Note: Regression similar to Table A.6, but on sample including children with immigration background. P-values in parentheses, based on standard errors clustered at preschool level. $^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$.

Table A.24: Treatment-Control Differences in Parental Investments — Including Children with Immigrant Background

	(1) Reading Inv.	(2) Noncog Inv.
Treated × High school/less	0.145	0.189*
	(0.163)	(0.060)
Treated × College/more	0.102	−0.152*
	(0.226)	(0.059)
College/more	0.230**	0.051
	(0.010)	(0.604)
Child age	−0.134**	−0.050
	(0.016)	(0.387)
Born in 2007	−0.763***	−0.891***
	(0.005)	(0.000)
Born in 2008	−0.587**	−0.700***
	(0.034)	(0.004)
Born in 2009	−0.517*	−0.783***
	(0.066)	(0.003)
Born in 2010	−0.552*	−0.869***
	(0.080)	(0.004)
Male	0.032	0.077
	(0.556)	(0.166)
Birth weight (kg)	−0.149**	−0.145**
	(0.012)	(0.020)
Gestation (wks)	0.025	−0.009
	(0.264)	(0.629)
Apgar score	0.010	−0.027
	(0.818)	(0.530)
Number of Siblings	−0.040	0.002
	(0.230)	(0.967)
Mother weight (kg)	−0.001	0.004*
	(0.667)	(0.082)
Mother age	0.009	−0.018**
	(0.236)	(0.016)
Mother employed	0.110	−0.157*
	(0.253)	(0.053)
Father age	0.007	0.010
	(0.215)	(0.157)
Father employed	0.041	0.150
	(0.685)	(0.201)
Household inc(1,000 USD)	−0.001**	−0.001*
	(0.014)	(0.086)
Immigrant Background	−0.290*	0.184
	(0.060)	(0.193)
Constant	0.316	2.378**
	(0.770)	(0.011)
Observations	1,394	1,394

Note: Regression similar to Table A.7, but on sample including children with immigration background. P-values in parentheses, based on standard errors clustered at preschool level. $^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$.

B Model of Skill Formation with Parental and Public Investments

B.1 The General Model

This appendix discusses a model of skill formation with public and private investments, as outlined in Section 5.1. The technology of skill formation we use begins with a standard production function for univariate end-of-period skills θ_t that includes self-productivity from θ_{t-1} and investments I_t:

$$\theta_t = j(\theta_{t-1}, I_t) \tag{B.1}$$

Investment is itself a function of parental direct investments P_t and skill investments via the institutional setting, or public G_t, where parents shape $P_t = p(x_t, \theta_P)$ through direct time investments x_t, of which the efficacy depends on their own skills θ_P. Public investments are a function of the neighborhood, which parents buy into via their wages, which are a function of their skills. The public may also decide to invest exogenously with $\underline{G}_t$ (this is where the intervention will happen). Public investments are thus a function $G_t = g(\theta_P, \underline{G}_t)$:

$$I_t = m\left(p(x_t, \theta_P), g(\theta_P, \underline{G}_t)\right). \tag{B.2}$$

Parents derive utility from their child's future skills, as well as from their own contemporaneous and future consumption and leisure. Parents spend their available time of 1 on child investments x_t, work in the labor market h_t, and leisure l_t:

$$1 = h_t + x_t + l_t \quad \text{for} \quad t \in \{1, 2\} \tag{B.3}$$

Without borrowing, parents' budget constraints each period are given by skill-specific wage rate $w\left(\theta_P\right)$:

$$c_t = h_t w\left(\theta_P\right) \tag{B.4}$$

If we consider a two-period model, parental **utility** is the following function of parental consumption and children's future skills:

$$U(c_1, c_2, l_1, l_2, \theta_2) = u_1(c_1, l_1) + \beta u_2(c_2, l_2) + \beta^2 V\left(\theta_2\left(\theta_1\left(\theta_0, I_1(x_1, \theta_P, \underline{G}_1)\right), I_2(x_2, \theta_P, \underline{G}_2)\right)\right) \tag{B.5}$$

where β is the discount factor. Parents maximize this utility, subject to the technology described in Eqs. (B.1) and (B.2) and time and budget constraints in Eqs. (B.3) and (B.4). The Lagrangian

for this problem (ignoring the non-negativity constraints on time use) is

$$\begin{aligned}\mathcal{L}_{c_1,c_2,h_1,h_2,x_1,x_2,l_1,l_2} = & u_1(c_1,l_1) + \beta u_2(c_2,l_2) + \beta^2 V\left(\theta_2\left(\theta_1\left(\theta_0, I_1(x_1,\theta_P,\underline{G}_1)\right), I_2(x_2,\theta_P,\underline{G}_2)\right)\right) \\ & + \lambda_1\left(h_1 w\left(\theta_P\right) - c_1\right) \\ & + \lambda_2\left(h_2 w\left(\theta_P\right) - c_2\right) \\ & + \lambda_3\left(1 - h_1 - x_1 - l_1\right) \\ & + \lambda_4\left(1 - h_2 - x_2 - l_1\right)\end{aligned}$$

The straightforward first-order-conditions can be combined to yield the following equilibrium conditions in period 2:

$$\beta \frac{\partial V}{\partial \theta_2} \frac{\partial \theta_2\left(\theta_1, x_2, \theta_P, \underline{G}_2\right)}{\partial x_2} = \frac{\partial u_2}{\partial l_2} \tag{B.6}$$

$$= w\left(\theta_P\right) \frac{\partial u_2}{\partial c_2}. \tag{B.7}$$

In equilibrium, parents must be indifferent in allocating their time to direct investments in children (giving indirect utility through future child skills), additional leisure (giving direct utility), or consumption (converted to time-units via the multiplication with the wage rate).

B.1.1 Introducing the RCT in the model

An exogenous investment by the RCT will raise θ_1, child skills, without the parents adjusting their investments. This assumes that parents do not observe the increased skills right away, but only once they manifest at the end of the period. In the next period, parents can adjust their time allocation between investments and leisure as well as consumption to maintain the equilibrium condition in Eqs. (B.6) and (B.7).

Plain comparative statics can give an idea of how parents might react. A successful intervention will raise θ_1, and thereby θ_2, everything else equal (assuming only that skills are self-productive and not detrimental). This will lower the marginal utility from future child skills in $\partial V/\partial\theta_2$. Parents can lower the two right-hand sides by increasing consumption or leisure (consuming some of the benefits from exogenously higher future utility from higher child skills).

It is not certain ex ante, however, whether the full left-hand-side decreases, because increased θ_1 might increase or decrease the effectiveness of parental investments, $\partial\theta_2/\partial x_2$, depending on complementarities between θ_1 and the other terms in the production function. If the levels of parental investments, parental quality, and school quality are such that an increase in θ_1 *raises* the effectiveness of parental investments $\left(\frac{\partial^2\theta_2\left(\theta_1,x_2,\theta_P,\underline{G}_2\right)}{\partial x_2 \partial \theta_1} > 0\right)$, parents might not have to adjust, or even *increase* their investments if the productivity-effect is larger than the decreased marginal utility.

It could of course also be that θ_1 and x_2 are substitutes, such that $\frac{\partial^2\theta_2\left(\theta_1,x_2,\theta_P,\underline{G}_2\right)}{\partial x_2 \partial \theta_1} < 0$. In this case, parents should *reduce* investments by lowering x_2, or increase consumption or leisure.

B.1.2 Analyzing Long-run Treatment Effects of RCT

The long-run treatment effect of the RCT is given by the **total derivative** of long-run skills with respect to an exogenous change in skills from the first period, θ_1:

$$\frac{d\theta_2}{d\theta_1} = \underbrace{\frac{\partial\theta_2}{\partial\theta_1}}_{\substack{\text{Self-productivity} \\ \text{of increased } \theta_1}} + \underbrace{\frac{\partial\theta_2}{\partial x_2}}_{\substack{\text{Productivity} \\ \text{of parents'} \\ \text{time investments}}} \cdot \underbrace{\frac{\partial x_2^*}{\partial\theta_1}}_{\substack{\text{Re-optimization} \\ \text{of parents'} \\ \text{investments} \\ \text{after intervention}}} \tag{B.8}$$

(all evaluated at levels of x_2 before the change in θ_1).

From the treatment effects on parental investments, we know that only one group of parents adjusts their investments in reading skills: parents with low education and low school quality. For all other groups, changes in reading investments are not statistically significantly different from zero. The same is true for adjustments in non-cognitive investments, with the addition that the *reduction* in investments for highly educated parents with high school quality is statistically significant.

We now go through a few more detailed analyses of Eq. (B.8) for the four groups of children analyzed in the paper: parental education levels high and low ($\theta_P^{high}, \theta_P^{low}$), and school quality high and low ($\underline{G}_2^{high}, \underline{G}_2^{low}$).

$$\frac{\partial x_2^*}{\partial\theta_1} = + \text{ only for } \theta_P^{low}, \underline{G}_2^{low}, 0 \text{ for rest} \tag{B.9}$$

From the treatment effects on *long-run skills* in Table 8, we know that

$$\left.\frac{d\theta_2}{d\theta_1}\right|_{\theta_P^{low},\underline{G}_2^{low}} > \left.\frac{d\theta_2}{d\theta_1}\right|_{\theta_P^{low},\underline{G}_2^{high}} \text{ and } \left.\frac{d\theta_2}{d\theta_1}\right|_{\theta_P^{high},\underline{G}_2^{low}} \text{ and } \left.\frac{d\theta_2}{d\theta_1}\right|_{\theta_P^{high},\underline{G}_2^{high}} \tag{B.10}$$

$$\left.\frac{d\theta_2}{d\theta_1}\right|_{\theta_P^{low},\underline{G}_2^{high}} = \left.\frac{d\theta_2}{d\theta_1}\right|_{\theta_P^{high},\underline{G}_2^{low}} = \text{insig} \tag{B.11}$$

$$\left.\frac{d\theta_2}{d\theta_1}\right|_{\theta_P^{low},\underline{G}_2^{high}} >^* \left.\frac{d\theta_2}{d\theta_1}\right|_{\theta_P^{high},\underline{G}_2^{high}} \tag{B.12}$$

Evaluating the total derivative in Eq. (B.8) at different levels of parental quality and school quality, starting with Eq. (B.11):

$$\left.\frac{d\theta_2}{d\theta_1}\right|_{\theta_P^{low},\underline{G}_2^{high}} = 0 \tag{B.13}$$

$$\Leftrightarrow \left.\frac{\partial\theta_2}{\partial\theta_1}\right|_{\theta_P^{low},\underline{G}_2^{high}} = -\left.\frac{\partial\theta_2}{\partial x_2}\frac{\partial x_2^*}{\partial\theta_1}\right|_{\theta_P^{low},\underline{G}_2^{high}} = -\left.\frac{\partial\theta_2}{\partial x_2}\right|_{\theta_P^{low},\underline{G}_2^{high}} \cdot 0 \tag{B.14}$$

$$\left.\frac{\partial\theta_2}{\partial\theta_1}\right|_{\theta_P^{low},\underline{G}_2^{high}} = 0 \tag{B.15}$$

where the equality to Eq. (B.14) stems from the fact that $\frac{\partial x_2^*}{\partial \theta_1}$ is not statistically significantly different from zero. Similarly,

$$\left.\frac{\partial \theta_2}{\partial \theta_1}\right|_{\theta_P^{high}, \underline{G}_2^{low}} = 0 \tag{B.16}$$

These last two results imply that there is quite little direct self-productivity from θ_1 to θ_2. We take this with a grain of salt, because the point estimates for the total change in θ_2 were positive, just not statistically significant. We do take from this exercise, however, that without sustained parental investments, child skills do not self-produce to later periods in a major way.

From the contrast between treatment effects and changes in parental investments for the different education levels of parents within high-quality schools, we see that

$$\left.\frac{d\theta_2}{d\theta_1}\right|_{\theta_P^{low}, \underline{G}_2^{high}} > \left.\frac{d\theta_2}{d\theta_1}\right|_{\theta_P^{high}, \underline{G}_2^{high}} \tag{B.17}$$

$$\underbrace{\left.\frac{\partial \theta_2}{\partial \theta_1}\right|_{\theta_P^{low}, \underline{G}_2^{high}}}_{=0} + \left.\frac{\partial \theta_2}{\partial x_2}\frac{\partial x_2^*}{\partial \theta_1}\right|_{\theta_P^{low}, \underline{G}_2^{high}} > \left.\frac{\partial \theta_2}{\partial \theta_1}\right|_{\theta_P^{high}, \underline{G}_2^{high}} + \left.\frac{\partial \theta_2}{\partial x_2}\frac{\partial x_2^*}{\partial \theta_1}\right|_{\theta_P^{high}, \underline{G}_2^{high}} \tag{B.18}$$

$$\left.\frac{\partial \theta_2}{\partial x_2}\frac{\partial x_2^*}{\partial \theta_1}\right|_{\theta_P^{low}, \underline{G}_2^{high}} - \left.\frac{\partial \theta_2}{\partial x_2}\frac{\partial x_2^*}{\partial \theta_1}\right|_{\theta_P^{high}, \underline{G}_2^{high}} > \underbrace{\left.\frac{\partial \theta_2}{\partial \theta_1}\right|_{\theta_P^{high}, \underline{G}_2^{high}}}_{\geq 0} \tag{B.19}$$

$$\Leftrightarrow$$

$$\left.\frac{\partial \theta_2}{\partial x_2}\frac{\partial x_2^*}{\partial \theta_1}\right|_{\theta_P^{low}, \underline{G}_2^{high}} > \left.\frac{\partial \theta_2}{\partial x_2}\frac{\partial x_2^*}{\partial \theta_1}\right|_{\theta_P^{high}, \underline{G}_2^{high}} \tag{B.20}$$

$$\Leftrightarrow$$

$$\frac{\left.\frac{\partial x_2^*}{\partial \theta_1}\right|_{\theta_P^{low}, \underline{G}_2^{high}}}{\left.\frac{\partial x_2^*}{\partial \theta_1}\right|_{\theta_P^{high}, \underline{G}_2^{high}}} > \frac{\left.\frac{\partial \theta_2}{\partial x_2}\right|_{\theta_P^{high}, \underline{G}_2^{high}}}{\left.\frac{\partial \theta_2}{\partial x_2}\right|_{\theta_P^{low}, \underline{G}_2^{high}}} \tag{B.21}$$

From Eq. (B.21), we infer that the productivity of investments on skills ($\partial\theta_2/\partial x_2$) is smaller in $\theta_P^{high}, \underline{G}_2^{high}$ parents relative to $\theta_P^{low}, \underline{G}_2^{high}$ parents than the excess effect of the intervention on parental investments in $\theta_P^{low}, \underline{G}_2^{high}$ parents. This excess effect on the left-hand side ranges from zero (in reading) to positive (in non-cognitive investments). That is because reading investments are equally affected between $\theta_P^{low}, \underline{G}_2^{high}$ and $\theta_P^{high}, \underline{G}_2^{high}$ parents, and the changes in non-cognitive investments are *greater* in $\theta_P^{low}, \underline{G}_2^{high}$ than $\theta_P^{high}, \underline{G}_2^{high}$ parents (where they are actually significantly negative). This points to a greater productivity of investments in children of low-educated parents than highly educated parents, among children who face good quality schools in period 2. This finding is reasonably consistent with observed investment patterns.

C Data appendix

C.1 The Survey

In late April 2017, an invitation to participate in a survey was sent to all parents with children who had participated in the intervention. The invitation was sent via the personalized secure email *e-Boks*[1] to minimize non-response and ensure that all parents received the invitation. All residents in Denmark have such an email inbox in *e-Boks* and use this to receive (and send) official communications, such as from employers or public sector officials, on everything from children's medical visits, preschool and school enrolment, reception of public transfers, tax records, etc.

The letter is presented below.[2]

[1] See https://www.e-boks.com/danmark/en/what-is-e-boks/.

[2] In English:

Dear Parents to [Child]

We are a group of researchers who are studying the environments that help children flourish and provide them with the best possible beginning of their life.

Your child's daycare has been part of a project focussing on children's language development, and you were in this context asked to participate in a survey a couple of years ago.

The interplay between different activities in a child's day

We would like to request your assistance by filling our a similar questionnaire. The questionnaire ask questions relating to your everyday activities, habits, and how your view your child's everyday. We would like to ask you this to improve our understanding of how children's everyday activities in- and outside the home environment are linked.

The questionnaire can be found by following this link: LINK

It will at most take 15 minutes to respond to the questionnaire, and you will – upon completion – participate in a lottery with the possibility of winning an iPad. Lottery-participation is not conditional on having participated in the old survey.

The study has been approved by the Danish Data Authorities (National IRB board) and *all information is confidential and will be anonymized.*

We hope you will participate in the survey and thereby provide an important contribution to the understanding of the early childhood of all children. If you have any questions, please let us know by writing to: startpaalivet econ.au.dk.

Sincerely,
Dorthe Bleses (Professor, TrygFonden's Centre for Child Research)
Rasmus Landersø (Rasmus Landersø, Senior Research, The Rockwool Foundation Research Unit)

Den 21. april 2017

Kære forældre til [*barns navn*]

Vi er en gruppe af forskere, der er i færd med at undersøge, hvordan børn får de bedste betingelser til at udvikle sig under opvæksten og den bedst mulige start på livet.

Jeres barns dagtilbud har tidligere været med i et projekt med fokus på børns sproglige udvikling, og i den forbindelse har I for ca. 2 [3, 4] år siden fået tilsendt et spørgeskema.

Samspillet mellem aktiviteter i børns hverdag

Vi vil nu bede jer om at hjælpe os igen ved at udfylde et lignende spørgeskema. Det handler om jeres hjem, vaner og opfattelse af jeres barns hverdag. Vi vil gerne spørge jer om dette for bedre at forstå samspillet mellem de aktiviteter, som børn laver i deres hverdag både ude og hjemme.

Spørgeskemaet findes på dette link: www.spørgeskema.dk.

Det tager kun ca. 15 minutter at besvare spørgeskemaet, og når I besvarer, deltager I samtidig i en lodtrækning om en iPad. I behøver ikke have besvaret det foregående spørgeskema for ca. 2 [3, 4] år siden for at besvare dette.

Undersøgelsen er godkendt af Datatilsynet, og *alle oplysninger behandles anonymt og fortroligt*.

Vi håber, at I kan hjælpe os, og derved give et vigtigt bidrag til at øge forståelsen af, hvordan samfundet bedst muligt kan hjælpe alle børn på vej i deres tidlige år. Hvis I har spørgsmål til projektet, kan I kontakte os på startpaalivet@econ.au.dk.

Venlig hilsen

Dorthe Bleses (Professor, TrygFondens Børneforskningscenter på Aarhus Universitet)
Rasmus Landersø (Seniorforsker, ROCKWOOL Fonden)

Following the letter, two reminders were sent to non-respondents, and later non-respondents were contacted by phone.

C.2 Survey Response

The survey-response rate was 60%. In the main results, we do include non-respondents (as we have information on all the remaining key variables from the initial post-trial test scores and subsequent full population register data).

Table A.4 in Appendix A presents estimation results from regressions of survey-response (0/1) on baseline characteristics and treatment status. Survey response is not random: As would be expected, respondents are parents of more highly skilled children (pre-test), and are employed.

Note that child skills are correlated with parental age and years of schooling, and family income (also shown after the data description in Table 3). Importantly, there are no significant differences in response rates by treatment status, interacted with parental education.

C.3 Data Construction

This section describes the data construction. The first step was to collect the data from the intervention (see Section 2.2) and transfer it to Statistics Denmark. Here, the data was anonymized (i.e. all social security numbers were changed to anonymized unique *pnr*-numbers) with a code facilitating the link between the intervention data and the register data using the anonymized pnr-numbers. A similar procedure was conducted once the survey data had been collected.

The register data encompasses the entire population of Denmark from 1980 to the present with parent identifiers and household identifiers, allowing us to link the children from the intervention to their parents. From the demographic register we also identify the children's country of origin, date of birth, and home addresses (all anonymized). We also link the children to the educational register. These data also include unique preschool and school identifiers (institution-numbers) allowing us to identify the institutions the children attend along with their peers at the same institutions.

C.4 Background Characteristics and Outcomes

The National Birth Register provides information on children's birth weight, gestation length, Apgar score, and mothers' weight at the time of pregnancy.

Using the parental identifiers, we also include information on parents' completed education from the educational register (referring to education in 2014), employment status from the labor market register (for the year 2017), and household income from the income register (based on tax authorities' information, for the year 2017). Parent and child ages are recorded for September 1st, 2017.

Child outcomes The pre- and post-trial tests are constructed from 50 items relating to sound discrimination, rhymes, word-segmentation, and letter identification. We standardize the tests (mean zero, standard deviation of 1) relative to the control group.

The grade 2 test scores are part of the compulsory national tests from grade 2 through 8 (with language tests in grades 2, 4, 6, 8). The tests focus on three underlying constructs: Reading comprehension, decoding, and language comprehension, and they take place near the end of the school year. The tests are performed on computers using an adaptive system in which questions are determined by the student's performance earlier in the test. The test is scored electronically without teacher input. Following Sievertsen et al. (2016) and Beuchert and Nandrup (2018), we standardize these three individual scores, take the simple average, and re-standardize them within year.

Parent outcomes We construct *parental investments* from a factor analysis with 26 items that describe parental activities and opinions. After extensive exploratory factor analysis, we perform a principal-component analysis with the number of factors limited to five, adding an oblique promax rotation with power 3. The estimates are reported in Table C.1. From these estimates, we predict five factor scores with Bartlett scores. The six statements/questions that load on the parental investment factor have six potential answers ranging from, for example, highly disagree to highly agree. We assign these answers values 1 to 6 in the factor analysis. Note that if we predict a parental investment factor score from a factor analysis that uses exclusively the parental investment items (instead of the full list of 26 as in Table C.1, the results are very similar. These two versions of a parental investment factor are correlated at .97.

Items that mainly load on parental reading investment factor

- How many times last week has your child been read to (or read with) at home?
- If your child can read, how often in the past week have you sat with your child while it read to you?
- How many times last week have you or your child read, not counting schoolwork?
- I think it is boring or difficult to read for my child.
- I enjoy reading for my child.
- I am often too busy or too tired to read to my child.

Items that mainly load on parental reading investment factor

- I do a lot to teach my child to focus, concentrate, and complete a task.
- When I play or read with my child, it is important to finish before we stop or start new things.
- During the last week, how often did you and your child do everyday activities together, such as cooking?
- How often did you talk with your child about what they have done in preschool/school in the last week?
- How many times during the last month have you talked to your child about how he/she is doing more generally?

Table C.1: Factor Loading Matrix of Parental Activities and Opinions

	Neg.Pub Eval	Parental Inv.	Growth Mindset	Home Capital	Non-cog Investments
How many times last week has your child been read to (or read with) at home?	0.075	0.709	-0.094	0.055	0.244
If your child can read, how often in the past week have you sat with your child ...	0.080	0.528	-0.108	-0.160	0.391
How many times last week have you or your child read, not counting schoolwork?	0.055	0.585	-0.084	0.190	0.159
I think it is boring or difficult to read for my child.	0.063	-0.620	-0.154	-0.020	0.155
I enjoy reading for my child.	-0.004	0.643	0.146	0.033	-0.068
I am often too busy or too tired to read to my child.	0.074	-0.696	0.037	0.044	-0.057
As a parent, I have a big influence on how my child is going to learn to read, ...	-0.003	0.092	0.566	-0.030	0.169
My child's ability to learn to read, count and calculate are intrinsic ...	-0.063	0.059	-0.568	-0.020	0.053
My child can always improve its ability to learn to read and count, no matter ...	0.055	-0.081	0.670	-0.030	0.168
After a certain time my child will no longer be able to improve its ability to ...	-0.010	0.110	-0.615	-0.057	0.043
I can affect my child's ability to focus on completing a task.	-0.005	0.026	0.727	-0.003	0.090
There is not much I can change if my child has a harder time concentrating.	0.048	-0.046	-0.672	-0.025	0.034
I do a lot to teach my child to focus, concentrate, and complete a task.	-0.056	0.086	0.166	-0.169	0.544
When I play or read with my child, it is important to finish before we stop ...	0.152	0.049	0.090	-0.195	0.375
During the last week, how often did you and your child do everyday activities ...	-0.077	0.039	-0.009	0.293	0.490
How often did you talk with your child about what they have done in preschool ...	-0.100	0.113	0.047	0.001	0.622
How many times during the last month have you talked to your child ...	-0.028	0.035	0.121	0.079	0.493
I think the amount my child is being read to in preschool(school) is not sufficient.	0.678	-0.066	0.008	0.069	0.011
I would like my child to receive more help to develop his/her language.	0.679	-0.084	-0.032	-0.009	0.120
How satisfied are you with the quantity of language support your child receives?	-0.787	-0.152	-0.038	0.010	0.293
How satisfied are you with the quality of language support your child receives?	-0.822	-0.149	-0.075	-0.029	0.276
One of the reasons I support my child's ability to focus, concentrate, ...	0.667	-0.098	-0.005	0.020	0.173
I would like my child to receive more help to develop his ability to concentrate	0.610	-0.109	-0.094	-0.017	0.186
How many books do you have in your home?	0.048	0.000	0.023	0.845	-0.078
How many children's books do you have in your home?	0.025	0.117	-0.025	0.757	-0.013
In the last week, how many times did you read books, newspapers, e-books, ...?	-0.034	-0.050	0.039	0.612	0.221

Note: Factor loadings after PCA on all 26 items listed here, limited to 5 factors, with oblique promax rotation (power 3). $N = 1,336$. "Neg.Pub.Eval." stands for a negative evaluation of the public investments by parents. "Parental Inv." is the parental direct time investment factor used in the main analyses. "Growth Mindset" relates to how parents view their child's potential to change, and their own potential to influence their child's growth in both the cognitive and non-cognitive domains. "Home Capital" relates to the capital present in the home that could foster reading and language. "Noncog. Important" describes how important it is for parents to foster their child's socio-emotional skills, in addition to reading and language.

Finally, we construct the variable on *hours worked* from survey responses to the following questions *At what time do you usually go to work?* and *At what time do you usually leave work?*.

School quality Our main measure of school quality is the average performance of students at a given school on the same tests as for our main outcome measure (compulsory, externally scored, national tests for grades 2–8 in Danish and math), but for the years 2010–2016. These are preceding the years in which any RCT participants would be in elementary school. Therefore, this time frame avoids any children who participated in the RCT being part of the quality measure, rendering it independent from the RCT.

We also generate an alternative measure of school quality that is based on the average characteristics of the teachers employed in each school in Denmark. We use a unique link developed by Statistics Denmark between all teachers (their pnr-numbers) and schools (institution-numbers) using employment records from the employer-employee match data to identify the full set of teachers employed at each school by January 1st from 2010-2016.

We link this data with the educational register, labor market register, and GPA from high school and teachers' college (UDG) to construct variables with each teacher's years of experience, tenure at a given school, unemployment spells and periods with sick leave, and GPA from high school and teachers' college.

The institution identifiers allow us to merge the aforementioned data with children's national test scores (see earlier paragraph). We obtain the predicted test scores from teacher characteristics by regressing the children's test scores on the school-by-year average teacher information. Finally, we rank schools from lowest to highest (0-1) by their predicted test score level.

Danish Well-being Survey The measures on well-being and socio-emotional skills come from students' answers on a large, national survey, "The Danish Wellbeing Survey." This is a yearly survey that is mandatory for public schools to administer since 2015. It is typically administered electronically during one class session. The announced purpose of the survey is to improve the well-being of all students at the school. Students are told that their individual responses will not be shown to their parents, teacher, or other persons at the school, that they should respond honestly, and that they could have the questions read aloud if they had reading problems or be helped in other ways. The questionnaires are linked to the students' national identification number, unless parents asked for their children to be anonymous—an option that exists since 2018.

Items that mainly load on General Well-Being

- Are you happy with your school?
- Are you happy with your class?
- Are you happy with your teachers?
- Can you concentrate in class?

Table C.2: Factor Structure in Well-Being Survey Grades 0-3

	General well-being	Social skills	Socio-em. Distress
Are you happy with your school?	0.579	0.166	0.030
Are you happy with your classroom?	0.372	0.315	0.068
Do you feel alone at school?	-0.108	0.262	0.537
Do you like the breaks at your school?	0.022	0.415	0.113
Are you happy with your teachers?	0.738	-0.027	-0.076
Does your stomach hurt when you're in school?	0.048	-0.104	0.699
Does your head hurt when you're in school?	0.141	-0.189	0.684
Are you good at solving your problems?	-0.032	0.639	-0.017
Can you concentrate in class?	0.260	0.244	0.180
Are you and your classmates good at helping each other?	0.224	0.537	-0.090
Do you think the other children in your class like you?	0.009	0.616	0.107
Are the teachers good at helping you in school?	0.631	0.068	-0.006
Is there anyone who is teasing you so you get sad?	-0.131	0.237	0.592
Are you afraid the other children will laugh at you?	-0.174	0.204	0.563
Do you get to say what you are doing in class?	0.043	0.471	-0.193
Are the classes boring?	0.651	-0.148	0.170
Do you learn something interesting in school?	0.662	0.091	-0.106
Is it difficult to hear what the teacher says in class?	0.165	-0.068	0.494

- Are the teachers good at helping you in school?
- Are the classes boring?
- Do you learn something interesting in school?

Items that mainly load on Social Skills

- Do you like the breaks at your school?
- Are you good at solving your problems?
- Are you and your classmates good at helping each other?
- Do you think the other children in your class like you?
- Do you get to say what you are doing in class?

Items that mainly load on Socio-emotional Distress

- Do you feel alone at school?
- Does your stomach hurt when you're in school?
- Does your head hurt when you're in school?

- Is there anyone who is teasing you so you get sad?
- Are you afraid the other children will laugh at you?
- Is it difficult to hear what the teacher says in class?

Sample Sizes For an overview of the availability of test scores and other outcomes, as well as parental investments, see Table C.3, with further breakdowns by treatment status presented in Table C.4.

Table C.3: Sample Sizes for Different Outcomes

	Individual Samples		
	mean	sd	count
Pre-Trial Test	0.039	1.009	2,301
Post-Trial Test	0.647	0.957	2,301
Language Test Gr.2	0.156	0.993	1,898
Math (Grade 3)	0.105	1.005	1,635
General well-being	-0.041	0.999	1,339
Social skills	0.021	0.977	1,339
Socio-em.distress	0.019	0.980	1,339
Reading Investment	0.013	0.990	1,338
Non-cognitive Investment	-0.012	0.998	1,338
	Conditional on Language Test Grade 2		
	mean	sd	count
Math (Grade 3)	0.112	1.002	1,602
General well-being	-0.034	0.982	1,321
Social skills	0.024	0.978	1,321
Socio-em.distress	0.016	0.967	1,321
Reading Investment	-0.012	0.984	1,103
Non-cognitive Investment	-0.024	1.002	1,103
	Conditional on Parent Survey		
	mean	sd	count
Math (Grade 3)	0.193	1.016	941
General well-being	-0.028	0.985	778
Social skills	0.052	0.962	778
Socio-em.distress	-0.038	0.941	778

Note: For a breakdown of sample sizes by treatment status and parental education, see Table C.4.

Table C.4: Number of Observations in different Treatment/Education/School Quality Groups

	(1) Full Sample	(2) Cond'l on Lang.Test Gr 2	(3) Cond'l on Lang & Parent Survey
Control, Low ed, Low def. school qual	154	138	55
Control, Low ed, High def. school qual	246	205	114
Control, High ed, Low def. school qual	135	103	72
Control, High ed, High def. school qual	615	508	303
Treatment, Low ed, Low def. school qual	106	89	42
Treatment, Low ed, High def. school qual	330	289	153
Treatment, High ed, Low def. school qual	89	66	38
Treatment, High ed, High def. school qual	626	500	326
Total	2,301	1,898	1,103

Note: Showing sample sizes for the full analysis sample (column 1, excluding children with immigration background), restricting on availability of the long-run language outcome (column 2), and additionally also on availability of responses on the parent survey (column 3).