Online Appendix: Intergenerational Transmission of Human Capital: Is It A One-Way Street?*

Petter Lundborg, Kaveh Majlesi

31st October 2017

Abstract

In this online appendix we present additional information, tables and figures to which we refer to but not include in the main text of the paper.

*Petter Lundborg: Department of Economics, Lund University, IZA, Centre for Economic Demography (email: petter.lundborg@nek.lu.se). Kaveh Majlesi: Department of Economics, Lund University, IZA, Centre for Economic Demography (email: kaveh.majlesi@nek.lu.se).

Appendices for Online Publication

Table A.1: Predicting reform participation

Independent variable:	All children Reform exposure	Males Reform exposure	Females Reform exposure
	Panel A: limited controls		
Parental schooling	0.012	0.012	0.012
	(0.000)***	(0.000)***	(0.000)***
N	2,547,966	1,302,318	1,245,648
Birth FE	YES	YES	YES
	Panel B: extended controls		
Parental schooling	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
N	2,547,966	1,302,318	1,245,648
Birth FE	YES	YES	YES
Municip. FE	YES	YES	YES
Municip. trends	YES	YES	YES

Notes: This table shows regressions on reform participation as a function of parental schooling. Panel A shows results while only controlling for birth cohort fixed effects. Panel B in addition controls for municipality fixed effects and municipality-specific trends. Standard errors clustered at the municipality level; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.2: Effect of children's schooling on parental survival: Results from instrumental variables regressions. Specifications include county-by-year fixed effects.

Independent variable:	(1) 65	(2) 70	(3) 75	(4) 80	(5) 85	(6) 90
	Panel A: Males, females, and all parents					
Schooling	0.004	0.000	0.008	0.005	0.000	0.001
	(0.004)	(0.005)	(0.006)	(0.007)	(0.007)	(0.006)
N	2,547,966	2,547,966	2,547,721	2,508,277	2,293,541	1,841,102
	Panel B: Males and all parents					
Schooling	-0.001	-0.003	-0.001	-0.003	-0.004	0.004
	(0.005)	(0.005)	(0.007)	(0.007)	(0.007)	(0.006)
N	1,302,318	1,302,318	1,302,202	1,282,198	1,172,391	941,229
	Panel C: Females and all parents					
Schooling	0.010	0.002	0.014	0.015	0.008	-0.006
	(0.008)	(0.009)	(0.011)	(0.011)	(0.011)	(0.010)
N	1,245,648	1,245,648	1,245,519	1,226,079	1,121,150	899,873

Notes: Panel A shows instrumental variables estimates of the effect of children's schooling on parents' survival until ages 65-90. Panel B shows IV estimates of the effect of sons' schooling on parents' survival. Panel C shows IV estimates of the effect of daughters' schooling on parents' survival. Specifications include municipality fixed effects, birth cohort fixed effects, and county-by-year fixed effects. Standard errors clustered at the municipality level;* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.3: Effect of children's schooling on parental survival: Sample of one-child families.

Independent variable:	(1) 65	(2) 70	(3) 75	(4) 80	(5) 85	(6) 90
			Panel A: Males, females, and all parents			
Schooling	0.002	0.005	0.014	0.011	0.003	-0.008
	(0.008)	(0.009)	(0.012)	(0.013)	(0.016)	(0.014)
N	874,337	874,337	874,096	844,430	742,899	602,914
			Panel B: Males and all parents			
Schooling	-0.003	-0.005	-0.000	-0.006	-0.011	-0.005
	(0.006)	(0.007)	(0.008)	(0.009)	(0.010)	(0.010)
N	758,783	758,783	758,671	741,506	665,782	535,161
			Panel C: Females and all parents			
Schooling	0.001	0.004	0.016	0.026	0.010	-0.018
	(0.008)	(0.010)	(0.011)	(0.013)**	(0.014)	(0.013)
N	743,683	743,683	743,554	726,570	653,255	525,471
			Panel D: Females and low-educated fathers			
Schooling	0.016	0.037	0.057	0.053	0.052	-0.013
	(0.014)	(0.019)**	(0.022)***	(0.022)**	(0.021)**	(0.018)
N	160,987	160,987	160,984	159,063	144,450	113,819

Notes: Sample is restricted to one-child families. Panel A shows instrumental variables estimates of the effect of children's schooling on parents' survival until ages 65-90. Panel B shows IV estimates of the effect of sons' schooling on parents' survival. Panel C shows IV estimates of the effect of daughters' schooling on parents' survival. Panel D shows the effect of daughters' schooling on low-educated fathers' survival. Specifications include municipality fixed effects, birth cohort fixed effects, and municipality-specific linear trends. Standard errors clustered at the municipality level;* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.4: Instrumental variables estimates of the effect of children's education on various potential mediators

Independent	(1)	(2)	(3)	(4)
	Panel A: Female children			
	Income	Income>0	Spouse schooling	Marriage
Schooling	-0.033	0.003	0.295	0.003
	(0.035)	(0.002)	(0.102)***	(0..014)
N	1,253,841	1,253,841	759,247	1,245,650
	Panel B: Male children			
	Income	Income>0	Spouse schooling	Marriage
Schooling	0.054	0.003	0.073	0.011
	(0.021)**	(0.004)	(0.060)	(0.008)
N	1,210,503	1,210,503	750,791	1,302,318

Notes: Panel A shows instrumental variables estimates of the effect of schooling on various outcomes for female children and Panel B shows the corresponding estimates for male children. Specifications include municipality fixed effects, birth cohort fixed effects, and municipality-specific linear trends. Standard errors clustered at the municipality level;* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.5: Effect of children's schooling on parental outcomes: Results from instrumental variables regressions.

Independent variable:	(1) Wealth	(2) Labor Supply 50-60	(3) Income 50-60	(4) Retirement age
		Panel A: Fathers and all children		
Schooling	0.018	-0.004	0.005	0.000
	(0.055)	(0.002)*	0.014	(0.078)
N	376,024	1,025,982	1,019,312	811,369
		Panel B: Mother and all children		
Schooling	-0.038	0.015	0.028	0.012
	(0.053)	(0.005)***	(0.027)	(0.087)
N	658,370	1,171,022	1,09,0448	938,630

Notes: Panel A shows instrumental variables estimates of the effect of children's schooling on parents' wealth (in year 2000), average labor market participation between ages 50-60 (average of non-missing values), average earnings between ages 50-60 (average of non-missing values), and retirement age (age at which the parent received any pension income). Panel B shows the corresponding effects for mothers. Specifications include municipality fixed effects, birth cohort fixed effects, and municipality-specific linear trends. Standard errors clustered at the municipality level;* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.6: Effect of children's schooling on parental outcomes: Results from instrumental variables regressions.

Independent variable:	(1) Wealth	(2) Labor Supply 50-60	(3) Income 50-60	(4) Retirement age
		Panel A: Females, fathers		
Schooling	-0.022	-0.002	-0.008	-0.129
	(0.090)	(0.004)	(0.021)	(0.132)
N	183,599	500,966	497,724	396,226
		Panel B: Females, mothers		
Schooling	-0.040	0.018	0.038	-0.060
	(0.070)	(0.009)**	(0.043)	(0.138)
N	322,515	572,612	533,646	458,745
		Panel C: Males, fathers		
Schooling	0.015	-0.004	0.008	0.051
	(0.056)	(0.002)*	(0.016)	(0.083)
N	192,245	524,991	521,588	415,143
		Panel D: Males, mothers		
Schooling	-0.010	0.011	0.022	-0.008
	(0.041)	(0.006)*	(0.029)	(0.092)
N	335,855	598,410	556,802	479,885

Notes: Panel A-D shows instrumental variables estimates of the effect of children's schooling on parental outcomes separately by the gender of the child and the parent. The outcomes include wealth (in year 2000), average labor market participation between ages 50-60 (average of non-missing values), average earnings between ages 50-60 (average of non-missing values), and retirement age (age at which the parent received any pension income). Specifications include municipality fixed effects, birth cohort fixed effects, and municipality-specific linear trends. Standard errors clustered at the municipality level;* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.7: Effect of children's schooling on the probability of parents dying because of a specific cause: Results from instrumental variables regressions.

Independent variable:	(1) 65	(2) 70	(3) 75	(4) 80	(5) 85	(6) 90
			Panel A: Cancer			
Schooling	-0.001	-0.003	-0.003	-0.003	-0.003	-0.005
	(0.003)	(0.004)	(0.004)	(0.006)	(0.007)	(0.007)
N	2,547,966	2,547,966	2,547,721	2,508,277	2,293,541	1,841,102
			Panel B: Heart Disease			
Schooling	-0.002	-0.004	-0.009	-0.013	-0.014	-0.011
	(0.003)	(0.004)	(0.005)*	(0.006)**	(0.008)*	(0.010)
N	2,547,966	2,547,966	2,547,721	2,508,277	2,293,541	1,841,102
			Panel C: Respiratory Disease			
Schooling	0.003	0.003	0.002	0.006	0.005	0.008
	(0.001)**	(0.002)*	(0.002)	(0.003)**	(0.004)	(0.005)
N	2,547,966	2,547,966	2,547,721	2,508,277	2,293,541	1,841,102
			Panel D: Mental and behavioural disorders			
Schooling	-0.000	0.000	-0.000	-0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)
N	2,547,966	2,547,966	2,547,721	2,508,277	2,293,541	1,841,102
			Panel E: Accidents and external causes			
Schooling	-0.000	-0.000	-0.001	0.000	-0.002	-0.001
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)
N	2,547,966	2,547,966	2,547,721	2,508,277	2,293,541	1,841,102

Notes: This table shows instrumental variables estimates of the effect of children's schooling on the probability of parents dying before ages 65-90 for specific causes. Specifications include municipality fixed effects, birth cohort fixed effects, and municipality-specific linear trends. All children and all parents are included in the sample. Standard errors clustered at the municipality level;* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.8: Effect of children's schooling on the probability of parents dying because of a specific cause: Results from instrumental variables regressions. Daughters and low-educated fathers

Independent variable:	(1) 65	(2) 70	(3) 75	(4) 80	(5) 85	(6) 90
			Panel A: Cancer			
Schooling	-0.007	-0.018	-0.009	-0.007	0.002	0.007
	(0.008)	(0.010)*	(0.012)	(0.013)	(0.015)	(0.018)
N	287,066	287,066	287,063	284,977	265,027	213,468
			Panel B: Heart Disease			
Schooling	-0.013	-0.020	-0.034	-0.045	-0.057	-0.037
	(0.010)	(0.013)	(0.014)**	(0.016)***	(0.019)***	(0.019)*
N	287,066	287,066	287,063	284,977	265,027	213,468
			Panel C: Respiratory Disease			
Schooling	-0.005	-0.003	-0.007	-0.003	0.006	0.014
	(0.004)	(0.005)	(0.006)	(0.007)	(0.008)	(0.012)
N	287,066	287,066	287,063	284,977	265,027	213,468
			Panel D: Mental and behavioural disorders			
Schooling	-0.003	-0.005	-0.006	-0.001	0.004	0.003
	(0.003)	(0.003)*	(0.004)*	(0.004)	(0.005)	(0.007)
N	287,066	287,066	287,063	284,977	265,027	213,468
			Panel E: Accidents and external causes			
Schooling	0.002	-0.000	-0.002	0.002	0.001	0.009
	(0.002)	(0.003)	(0.004)	(0.004)	(0.005)	(0.007)
N	287,066	287,066	287,063	284,977	265,027	213,468

Notes: This table shows instrumental variables estimates of the effect of daughters' schooling on the probability of low-educated fathers dying before ages 65-90 for specific causes. Specifications include municipality fixed effects, birth cohort fixed effects, and municipality-specific linear trends. All children and all parents are included in the sample. Standard errors clustered at the municipality level;* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Online Appendix A: Dropping cohorts

As discussed in Section 7.4, the reform came with a system of ear marked resources for pupils in grades 7-9 that affected cohorts born before 1945. Moreover, the earliest cohorts in our data might have suffered from lower teacher quality as there was an initial shortage of teacher in early adopting municipalities. In panel A of Table A.9 below, we show that are results are robust to excluding cohorts born 1943 and 1944.

As we also explained in Section 7.4 all cohorts in our study, except for the 1954 and 1955 cohorts, were subject to tracking in the old system or to the system of parallel classes that allowed for tracking in the reform period. As shown in Panel B of Table A.9 below, our estimates do not change much when we drop the 1954 and 1955 cohorts.

Table A.9: Effect of children's schooling on parental survival: Results from instrumental variables regressions when dropping early and late cohorts.

Independent	(1)	(2)	(3)	(4)	(5)	(6)
variable:	65	70	75	80	85	90
	Panel A: Males, females, and all parents, dropping cohorts born 1943-1944					
Schooling	-0.004	-0.004	-0.000	-0.000	-0.008	-0.011
	(0.005)	(0.006)	(0.007)	(0.007)	(0.010)	(0.009)
N	1,950,383	1,950,383	1,950,138	1,910,694	1,696,141	1,269,173
	Panel B: Males, females, and all parents, dropping cohorts born 1954-1955					
Schooling	-0.002	-0.002	0.013	0.011	0.003	0.001
	(0.005)	(0.006)	(0.007)**	(0.007)	(0.008)	(0.008)
N	2,176,344	2,176,344	2,176,343	2,165,822	2,039,245	1,689,767

Notes: This table shows instrumental variables estimates of the effect of children's schooling on parents' survival until ages 65-90. Panel A shows IV estimates when dropping children born 1943-1944 and Panel B show IV estimates when dropping those born 1954-1955. Specifications include municipality fixed effects, birth cohort fixed effects, and municipality-specific linear trends. Standard errors clustered at the municipality level;* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Online Appendix B: Missing parents

For 2 percent of the children, we lack information on mothers and for 5 percent we lack information on fathers. The main reason for this is that a small fraction of parents do not survive until 1947 when personal identifiers were introduced in Sweden. If education has an effect on the probability of a parent surviving to 1947, our estimates may be biased. For instance, if education would have a positive effect on this probability, we would miss out some of the positive effect of children's education on parental survival. To investigate this issue, we run a regression on the effect of reform exposure on the probability of having missing parental information, using our main IV specification. For fathers, the point estimate is small (-0.004) and insignificant. For mothers, the point estimate is of similar magnitude and significant at the 10 percent level. These results suggest that missing parents cannot drive our main results.

We can also completely rule out that missing parents are affecting the results by restricting our analysis to later cohorts of children, where almost no parents are missing from the data. When we do so, by running our models on children born 1948 and later, we find similar effects as we find for our main sample that includes the cohorts born 1943 and later.

Table A.10: Effect of children's schooling on parental survival: Results from instrumental variables regressions. Additional control variables added.

Independent variable:	(1) 65	(2) 70	(3) 75	(4) 80	(5) 85	(6) 90
	Panel A: Males, females, and all parents					
Schooling	-0.003	-0.002	0.006	0.004	-0.002	-0.002
	(0.004)	(0.005)	(0.006)	(0.007)	(0.009)	(0.007)
N	2,547,966	2,547,966	2,547,721	2,508,277	2,293,541	1,841,102
	Panel B: Females, and fathers					
Schooling	0.004	0.008	0.021	0.020	0.017	-0.002
	(0.010)	(0.012)	(0.013)	(0.013)	(0.012)	(0.011)
N	605,798	605,798	605,793	602,136	568,485	480,184
	Panel C: female children and Low-educated fathers					
Schooling	0.013	0.024	0.042	0.037	0.035	-0.012
	(0.011)	(0.014)	(0.017)**	(0.016)**	(0.015)**	(0.014)
N	287,066	287,066	287,063	284,977	265,027	213,468

Notes: Panel A shows instrumental variables estimates of the effect of children's schooling on parents' survival until ages 65-90. The specifications include an extented set of control variables including mother's birth year, father's birth year, mother's years of schooling, father's years of schooling, birth order (dummies) and mother's age at birth (dummies). In addition, the specifications include municipality fixed effects, birth cohort fixed effects, and municipality-specific linear trends. Standard errors clustered at the municipality level;* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.11: Effect of children's schooling on parental survival: Results from instrumental variables regressions using various cutoffs on parents' birth year. All parents and all children.

Independent variable:	(1) 65	(2) 70	(3) 75	(4) 80	(5) 85	(6) 90
			Panel A: Parents born 1910 onwards			
Schooling	-0.003	-0.005	0.000	0.001	-0.006	-0.009
	(0.005)	(0.005)	(0.006)	(0.006)	(0.008)	(0.008)
N	2,134,530	2,134,530	2,134,285	2,094,841	1,880,105	1,427,666
			Panel B: Parents born 1920 onwards			
Schooling	0.009	0.010	0.013	0.014	0.015	0.002
	(0.007)	(0.007)	(0.008)	(0.009)	(0.011)	(0.014)
N	1,077,344	1,077,344	1,077,099	1,037,655	822,919	370,480
			Panel C: Parents born 1930 onwards			
Schooling	0.017	0.021	0.024	0.076	-	-
	(0.019)	(0.022)	(0.028)	(0.039)*	-	-
N	140,852	140,852	140,607	101,163	-	-

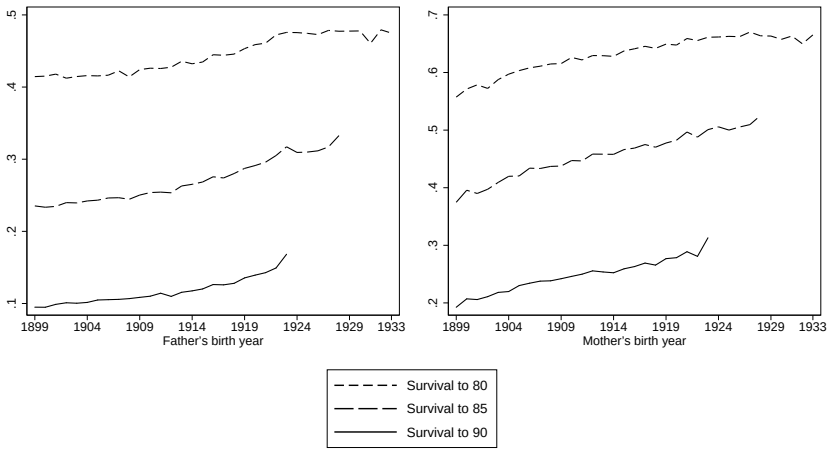
Notes: The table shows instrumental variables estimates of the effect of children's schooling on parents' survival until ages 65-90 using various restriction on parents' birth year. Panel A: parents born 1910 onwards. Panel B: parents born 1920 onwards. Panel C: parents born 1930 onwards. All specifications include municipality fixed effects, birth cohort fixed effects, and municipality-specific linear trends. Standard errors clustered at the municipality level;* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.12: OLS results. Children with less than 10 years of schooling.

Independent variable:	(1) 65	(2) 70	(3) 75	(4) 80	(5) 85	(6) 90
			Panel A: All children			
Schooling	0.007	0.010	0.014	0.017	0.017	0.012
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
N	703,024	703,024	702,947	691,146	632,221	513,532
			Panel B: Male children			
Schooling	0.006	0.008	0.012	0.016	0.017	0.013
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
N	397,025	397,025	396,988	390,395	356,570	289,580
			Panel C: Female children			
Schooling	0.009	0.012	0.017	0.020	0.018	0.013
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
N	305,999	305,999	305,959	300,751	275,651	223,952

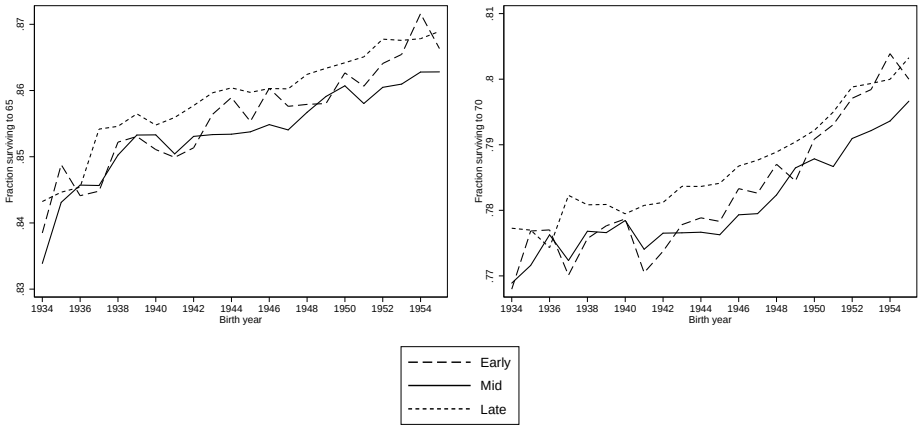
Notes: Panel A shows OLS estimates of the relationship between children's schooling and parents' survival until ages 65-90 for the sample of children having less than 10 years of schooling. Panel B shows OLS estimates on the relationship between sons' schooling and parents' survival. Panel C shows OLS estimates on the relationship between daughters' schooling and parents' survival. Specifications include municipality fixed effects and birth cohort fixed effects and controls for parental education and income (in 1970). Robust standard errors in parentheses;* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Figure A.1: Survival by parent cohort



Notes: The graph plots the likelihood of surviving to different ages for the the parent cohorts born 1899-1933 in our data.

Figure A.2: Trends in parental survival to ages 65-70 for early, mid, and late adopting municipalities.



Notes: The graph plots mean parental survival by cohorts of children born 1934-1955 and by early, mid, and late adopting municipalities of the schooling reform.