

Intergenerational Transmission of Education Across the 20th Century. A Sibling Correlation Approach*

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Abstract

We offer a fresh take on the question whether societies are becoming more open by analyzing sibling correlations in education across thirty countries and ten birth cohorts over the twentieth century. Sibling correlations can be interpreted as omnibus measures of family background effects, and less sibling resemblance in education indicates a weaker family background effect. Our data comprises 170 country–cohort combinations from 31 countries across all of the twentieth century, drawing on information of almost one million individuals. We show important variation in the family background effects across countries, revealing that in some countries families account for about a fifth of children’s educational attainment, in others the family influence is almost three times as big. We further identify seven countries where family background effects have been decreasing over time (e.g. Belgium, Italy, Australia), and one country with the opposite trend—China.

Introduction

Are we moving towards more open societies? In closed societies, individuals remain in the social class they were born into, in open societies, individuals

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have the chance of moving up or down from their social origins. A weaker link of social origins to educational attainment is often seen as a key indicator for greater equality of opportunity, which is of concern of the general public as well as for policy makers. The twentieth century has seen an unprecedented rise in the educational participation of individuals, but has equality of educational opportunity increased as well? These classical questions have been addressed in a rich and important body of work, with most studies finding little change over time and little differences between countries (e.g. Barone and Ruggera, 2018; Breen *et al.*, 2009, 2010; Bukodi *et al.*, 2018; Hertz *et al.*, 2007; Pfeffer, 2008; Shavit and Blossfeld, 1993; Van Doorn *et al.*, 2011). However, existing studies have mostly relied on associations of parental socio-economic status and children’s education, which are known to underestimate the effects of parental background on the education of their children: only measured aspects of family background can be accounted for. Our study overcomes this shortcoming by building and analyzing the largest compilation of sibling data to date.

Sibling correlations of educational attainment, i.e. the resemblance of education of children from the family, give a more complete estimate of family background effects on children’s education. The more siblings in a country or cohort resemble one another, the greater the effect of the family is. This family effect comprises genetic effects, observed and unobserved parental influences resources such as income, parenting, or cultural capital, parental cognitive and non-cognitive skills, school and neighborhood influences that siblings share, as well as inter-sibling influences. Sibling correlations have long been used in research on the transmission of socioeconomic status from parents to children (e.g. Sweetser, 1970), but were often based on small, non-representative samples.

To examine cross-national and cross-temporal variation in inequality of opportunity, we compile and analyze data from almost one million siblings from 30 countries, spanning birth cohorts across the twentieth century.

Data and Method

For assembling our data set, we conducted a wide-ranging data search of survey data that would allow us to collect all data that allows to estimate sibling correlations in education. In parallel, we conducted a systematic search of the sibling correlation literature to identify further data sets fit for our purposes. We restricted ourselves to survey data sets that were nationally representative, from Western or East Asian low-fertility countries, and where at least parental education was measured. We included data sets where respondents were asked about their siblings’ education, their children’s education, or household panel data where individuals are followed after they leave the parental home.

As of now, we have harmonized 65 data sets from 31 countries and expect

to include fifteen more data sets in our analyses in the next two months. We restrict our analyses to siblings who are at least 25 years of age to ensure that they have reached their final educational attainment and remove all country-cohorts with fewer than 300 siblings to ensure statistical precision. This leaves us with 170 country-cohort combinations.

Table 1 shows an illustration of the countries and the number of cohorts included in our analyses.

Table 1: Country-cohort combinations for analysis, each combination > 300 observations

Country	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
Australia	•	•	•	•	•	•	•	•		
Austria						•	•	•	•	
Belgium					•	•	•	•	•	
Bulgaria					•	•	•			
China			•	•	•	•	•	•	•	•
Croatia							•	•	•	
Czech Republic					•	•	•	•	•	
Denmark						•	•	•	•	
Eastern Germany								•	•	
Estonia						•	•	•	•	
France					•	•	•	•	•	
Greece						•	•	•	•	
Hungary					•	•	•	•	•	
Israel						•	•	•	•	
Italy						•	•	•	•	
Japan			•	•	•	•	•	•	•	
Luxembourg							•	•	•	
The Netherlands						•	•	•	•	
Poland						•	•	•	•	
Portugal							•	•	•	
Russia			•	•	•	•	•	•		
Slovakia						•	•			
Slovenia						•	•	•	•	
South Korea					•	•	•	•	•	
Spain			•	•	•	•	•	•	•	
Sweden	•	•	•	•	•	•	•	•	•	
Switzerland						•	•	•	•	
Taiwan		•	•	•	•	•	•	•	•	
USA		•	•	•	•	•	•	•		
Western Germany		•	•	•	•	•	•	•		

In order to calculate sibling correlations, we rely on the intraclass correlation coefficient (ICC), which is based on a simple model of years of education y_{ij} , where i indexes families and j indexes siblings:

$$y_{ij} = \mathbf{x}_{ij}\beta + \epsilon_{ij}, \text{ with } \epsilon_{ij} = a_i + b_{ij}.$$

\mathbf{x}_{ij} is a vector of control variables (sex, age, and whether the child is a singleton), and the residual ϵ_{ij} can be decomposed into a_i , a component common to all siblings in a family and b_{ij} , a sibling-specific component. Given that a_i and b_{ij} are uncorrelated, their variances are:

$$\sigma_\epsilon^2 = \sigma_a^2 + \sigma_b^2.$$

These variances can then be used to calculate the *ICC*, the correlation in educational attainment between siblings:

$$ICC = \frac{\sigma_a^2}{\sigma_a^2 + \sigma_b^2}.$$

In a second step, we model the sibling correlation as a function of the birth cohort to assess changes in the family background effect on education over time, using a random effects meta-regression (Harbord and Higgins, 2008).

First Results

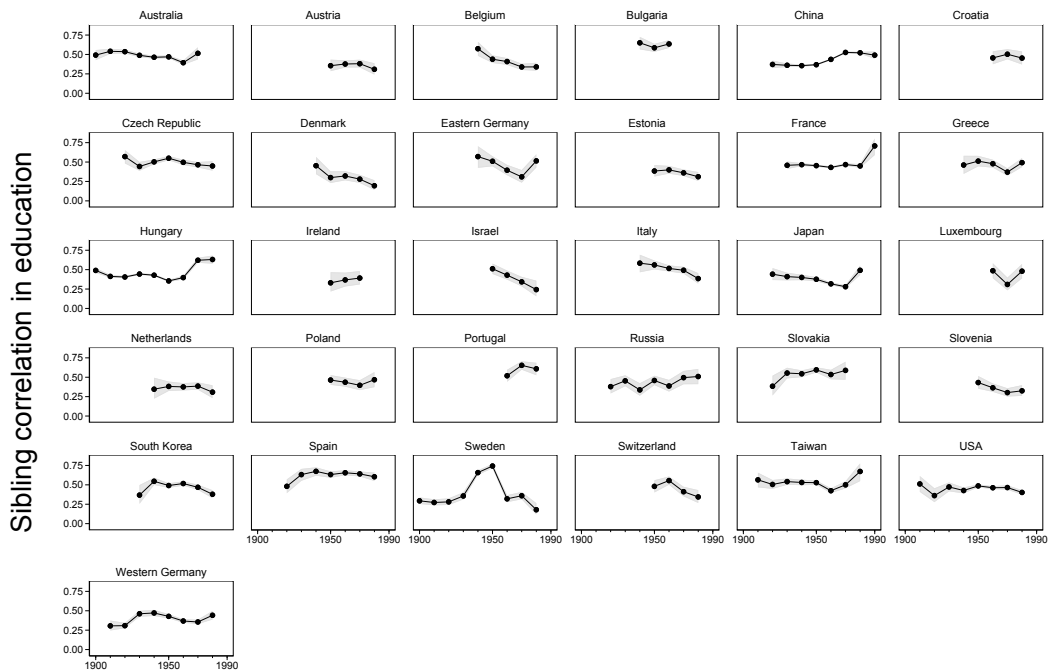


Figure 1: Sibling correlations in educational attainment by country and birth cohort

Figure 1 reveals that countries vary in the size of the family background effect, ranging from .20 in Denmark to .65 in Spain. Countries like Denmark, Slovenia, Austria, and Estonia, the Netherlands, and Western Germany show sibling correlations of less than .50, whereas a few countries like Greece, Hungary, Portugal, Bulgaria, and Spain have sibling correlations above that threshold.

Figure 2 answers our research questions whether we are moving towards more open societies. In the majority of countries, no change over time can

be detected at conventional levels of statistical significance. In seven out of 31 countries we see that sibling correlations are declining over time: in Israel, Belgium, Denmark, Italy, Slovenia, Estonia, and Australia. In one country, China, we see the opposite trend, family becomes more important for children’s educational outcomes.

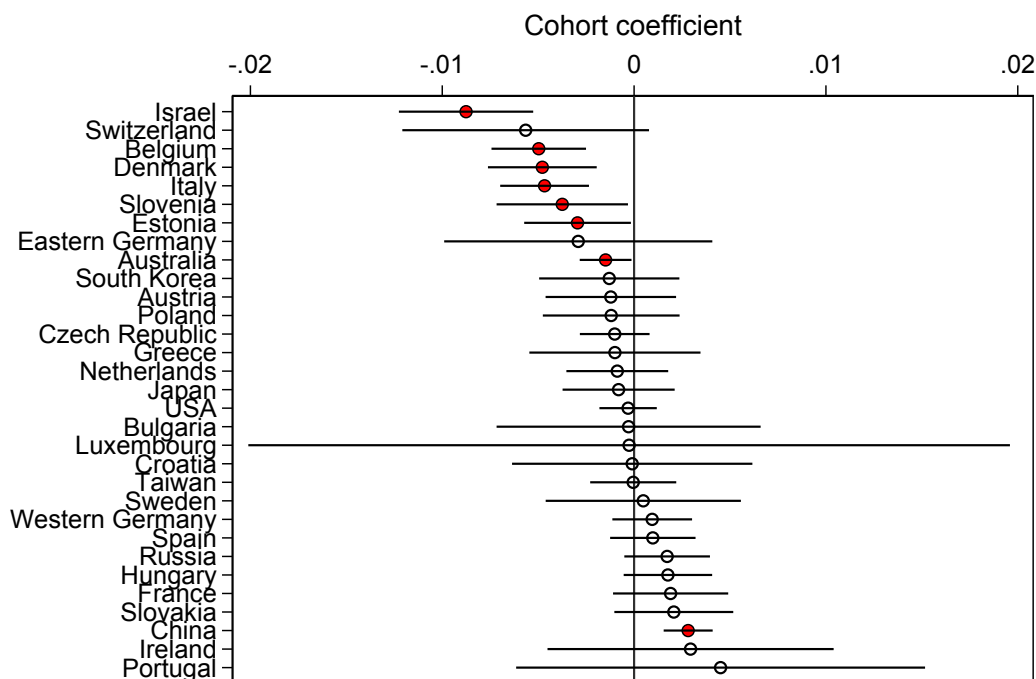


Figure 2: Time trends in sibling correlations in educational attainment. Red markers denote cohort coefficient with $p < .05$

Note: Error bars denote 95% confidence intervals. Estimates based on country-specific random-effects meta-regressions.

Preliminary Conclusions and Future Steps

Our analysis of sibling correlations in education from 31 countries across the twentieth century has shown that there are important country differences in the role of the family background for children’s life chances. Further, we were able to show that in a number of countries the role of the family for children’s educational outcomes have lost importance. In the majority of countries, the family background effect remained the same. China is the only country where we could find an increase in the importance of the family for children’s education.

Many societal developments have taken place over the past century that might have reduced the importance of the family, as health and nutrition have

improved for low-SES children, the finances situation of poor families have improved, families have become smaller (Präg *et al.*, 2018), more early childhood education, longer school hours, more remedial education, and later and more flexible tracking and streaming. Further, the number of schools has increased, incomes have risen and costs of schooling declined, compulsory schooling has increased, and public provision for unemployment and illness has come into existence. Nonetheless, the role of family and community effects has remained substantively similar in the majority of countries.

We are currently working on expanding our data base to incorporate ca. 15 more surveys. In a next step, we plan on decomposing the observed (e.g. due to parental education) and unobserved (e.g. genes) family background effect and to examine trends over time in the importance of the unobserved family background effect. We will also calculate parent–child correlations and compare those to the sibling correlations. Further, we will assess the development of brother correlations and sister correlations over time. In a final step, we will model the role of institutional and macro-economic factors on family background effects.

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