Growing Up Together: Sibling Correlation, Parental Influence, and Intergenerational Educational Mobility in Developing Countries*

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This version: April, 2025
First circulated draft: July, 2022

Abstract: Using data on 724,192 children from 277 waves of Demographic and Health Surveys, we report the first estimates of sibling correlation in schooling in 53 developing countries. Sibling correlation is a broad relative measure of educational opportunities, and is robust to coresidency bias. Sibling correlation is 46 percent higher in developing countries. Cross-country rankings and mobility trends are substantially different from those implied by the parents-children association in schooling. Relaxation of homogeneity and independence assumptions increases the share of fathers-children association in sibling correlation from 33 percent to 73 percent, contradicting the view that the main mechanisms are uncorrelated with parent's education.

Keywords: Sibling Correlation, Intergenerational Educational Mobility, Cross-country Ranking, Intergenerational Share, Bingley-Cappellari Decomposition Method

JEL Codes: J0, D3, J62

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1 Introduction

A large and growing literature on intergenerational mobility and inequality of opportunity analyzes the role of family and neighborhood background in shaping the life chances of a child.[1] This literature focuses primarily on developed countries, and reliable evidence on developing countries remains relatively sparse, primarily because of data limitations. Long-term panel data required for estimating permanent income of multiple generations are scarce in developing countries. Given the wide availability of schooling data, the literature has focused on estimating the influences of the socioeconomic background (family and neighborhood) on children's educational attainment in developing countries (see Iversen et al. (2021) for a recent survey).

The existing literature on intergenerational mobility in developing countries primarily focuses on the parents-children association in schooling (Torche (2019), Iversen et al. (2021), Emran and Shilpi (2021)).[2] This research program, however, faces two major challenges. First, in this approach, parental education is the sole indicator of children's socioeconomic background. It thus ignores the myriad family and neighborhood determinants of children's educational opportunities which are not correlated (or only weakly correlated) with parents' education. Second, most of the data sets available in developing countries do not include nonresident children because household surveys use a set of coresidency criteria to define household membership (Deaton (1987)).[3] A growing literature provides evidence that the estimates of some of the widely-used measures of parents-children association in education and occupation suffer large downward bias in coresident data, and the bias does not go down even when a researcher focuses on the subsample of younger children (Nicoletti and Francesconi (2006), Ahsan et al. (2025), Celhay and Gallegos (2025), Emran et al. (2018), and Azam and Bhatt (2015)).

The key to tackling these challenges is to adopt sibling correlation as a measure of relative mobility because (i) sibling correlation is a broad measure of the influences of socioeconomic status, and (ii) recent research offers convincing evidence (along with a theoretical rationale) that sibling correlation provides reliable estimates in coresident data available in most developing countries.[4] In their insightful survey and synthesis of measures of mobility, Deutscher and Mazumder (2023)

[1]For recent surveys, see Black and Devereux (2011), Bjorklund and Salvanes (2011), Solon (1999), Heckman and Mosso (2014), Breen (2010) and Torche (2015a), Mogstad and Torsvik (2021), Blanden et al. (2022).

[2]A partial list of the contributions on cross-country intergenerational educational mobility based on parents-children association includes Hertz et al. (2008), Neidhofer et al. (2018), Alesina et al. (2021), Azomahou and Yitbarek (2021), Dendir (2023), and Van Der Weide et al. (2023).

[3]For example, Ahsan et al. (2025) report coresidency rates of 28.73% in Ghana, 30.76% in Mexico, 34.14% in Indonesia, 48.31% in Bangladesh for 40 years and younger children.

[4]Some authors reserve the term "intergenerational mobility" for the measures of parents-children association in a given outcome such as permanent income or education. Following Deutscher and Mazumder (2023), we adopt a broad definition of intergenerational (im)mobility as the influences of inherited family and neighborhood background on children's life outcomes. Sibling correlation in income is one of the 19 *measures of income mobility* analyzed by Deutscher and Mazumder (2023).

classify sibling correlation as a "broad relative" measure as it captures a broad set of observed and unobserved family and neighborhood factors shared by siblings while growing up together, not only the influences of parents' education captured by the widely-used measures such as intergenerational regression coefficient (IGRC) and intergenerational correlation (IGC) (see also Solon (1999), Bjorklund and Salvanes (2011), Blanden et al. (2022)).[5]

Sibling correlation is also effective in dealing with the sample truncation bias in coresident data. Ahsan et al. (2025) compare the estimated sibling correlations in schooling between the coresident samples and the full samples with all children, and find that sample truncation bias in the estimates of sibling correlation in a coresident sample is small (average bias is 4.30%) while the bias is much larger in other measures of relative educational mobility such as IGRC (average bias is 10.25%)). They offer a theoretical explanation for the small bias in sibling correlation: sample truncation causes offsetting biases in the numerator and denominator of sibling correlation formula.[6] Equally important, Ahsan et al. (2025) report that sibling correlation estimates in coresident samples are reliable for cross-country ranking, as the correct ranking is preserved 90%-95% times. In contrast, IGRC estimates from coresident data give correct ranking across countries only 67% times. Notwithstanding its conceptual and empirical advantages, estimates of sibling correlation are unavailable for most of the developing countries.[7] We provide reliable evidence on intergenerational educational mobility in 53 developing countries by estimating sibling correlation in schooling, and trace out the evolution of educational opportunities across three birth cohorts (1970s-1990s). Our study thus fills a large gap in the evidence-base on the role of inherited socioeconomic background in educational opportunities of children in developing countries.

A central focus of the literature has been on the link between sibling correlation and measures of relative mobility based on parents-children association: what proportion of sibling correlation in schooling can be attributed to the estimated IGRC and IGC? Evidence on developed countries suggests that the share of parents-children schooling association is only 20-40 percent of sibling correlation (Solon (1999), Bjorklund and Salvanes (2011), Blanden et al. (2022)). As discussed by Solon (1999), such small shares suggest that the main mechanisms of inequality of educational opportunity are not captured by parental education, and research and policy should focus on the family and neighborhood factors unrelated to parental education.[8] However, this would be a

[5]IGRC is the slope estimate from a regression of children's schooling on parent's schooling. IGC is the slope from a regression specification where both children's and parent's schooling are normalized by their respective generation-specific standard deviation in schooling. Note that these measures, including sibling correlation, are based on the idea of mobility as "origin independence": the life-outcomes of children should not depend on the "circumstances" inherited by birth (Roemer (1998)).

[6]The numerator is an estimate of the variance of the average schooling of siblings across households, while the denominator is an estimate of cross-sectional schooling inequality in children's generation.

[7]In a meta analysis of sibling correlation, Prag et al. (2019) cite only two papers on sibling correlation in education in developing countries.

[8]Note that parent's education is usually correlated with a variety of factors relevant for children's education,

seriously misleading conclusion if the low estimate is an artifact of restrictive homogeneity and independence assumptions implicit in the standard linear model of parents-children association used to estimate IGRC and IGC (for details, see the discussion by Bingley and Cappellari (2019)). A growing body of theoretical analysis and empirical evidence rejects the linear model in favor of a concave or convex educational mobility curve, implying that both homogeneity and independence assumptions are violated.[9]

We report estimates of the share of parents-children association in sibling correlation using the Bingley and Cappellari (2019) method that relaxes the homogeneity and independence assumptions. To our knowledge, we are the first to implement the nonparametric approach of Bingley and Cappellari (2019) to estimate the share of parents-children association in sibling correlation in schooling. However, to estimate the share, we need to use a measure of parents-children association that is robust to coresidency bias. Fortunately, there is substantial evidence that the bias in the estimates of IGC is small in coresident data (Emran et al. (2018), Celhay and Gallegos (2025), Ahsan et al. (2025)).[10] IGC also performs well in cross-country ranking: the probability of correct ranking in coresident data is 93% (see the evidence reported by Ahsan et al. (2025)). As benchmarks, we also report the share estimates based on the classic methods developed by Bjorklund and Jantti (2012), and Mazumder (2008) that rely on the standard model.

For our empirical analysis, we take advantage of 277 waves of data on 53 developing countries from Demographic and Health Survey (DHS) and assemble a data set of 724,192 children. We exclude the countries where the estimation sample from the DHS surveys has less than 1,000 observations. DHS provides high quality household survey data for a large number of developing countries.[11] We use years of schooling information from the household roster which provides us with comparable data across countries as the questionnaire for the household roster is standardized for all DHS surveys.[12] The availability of years of schooling in the DHS data makes it more reliable for our analysis compared to some other data sets such as census where education information is usually categorical: primary, secondary etc.

including geographic location choice for better schools and labor market, and higher educational aspirations.

[9]For theoretical models where parents-children association can be concave or convex, see Becker et al. (2015) and Ahsan et al. (2024). Emran et al. (2021) finds that the educational mobility curve is concave in India for both sons and daughters. Ahsan et al. (2024) report a convex curve in rural Indonesia.

[10]Emran et al. (2018) report that the bias in IGC is about one third of that in IGRC. The estimates of Ahsan et al. (2025) suggest that the bias in IGC is slightly higher than that in sibling correlation, but about 75% lower than that in IGRC.

[11]Recent studies that take advantage of DHS data for cross-country mobility analysis include Bhalotra and Rawlings (2013) and Lu and Vogl (2023). To avoid coresidency bias, they focus on the health and mortality of children at a young age, and explore intergenerational association between parents and children.

[12]One can expand the country coverage by including other household surveys such as living standards measurement study (LSMS) of the World Bank, but the cross-country differences then might be partly due to differences in survey instruments and enumeration protocols in DHS vs. LSMS. To ensure comparability, we refrain from using other surveys.

Our estimates and their comparisons with the existing literature suggest three key conclusions. First, the average sibling correlation in schooling in our 53 countries is 0.60, and the average for the top half of the distribution is 0.65.[13] Based on 56 estimates for developed countries from the literature, the average sibling correlation in schooling is 0.41.[14] Our estimates thus suggest a considerable gap in educational opportunities between the developing and developed worlds, strengthening the conclusions in the existing literature based on parents-children association of schooling (see Neidhofer et al. (2018), and Van Der Weide et al. (2023)).

Second, cross-country ranking of children's educational opportunities based on sibling correlation differs dramatically from that based on the IGC and IGRC estimates. Based on the DHS data, rank correlations between the IGRCs and sibling correlations are 0.61 for the 1970s, 0.47 for the 1980s and 0.60 for the 1990s cohorts.[15] The IGC and IGRC estimates available in the literature suggest an even more striking contrast between the rankings implied by sibling correlation versus IGRC and IGC.[16] The rank correlations between our sibling correlation estimates and the IGRC estimates reported by Van Der Weide et al. (2023) are 0.33 for the 1980s cohort and 0.62 for the 1970s cohort.[17] The estimated trend of relative mobility across birth cohorts based on sibling correlation often conflicts with the trends in the IGRC and IGC estimates, and this is true for the DHS data as well as the IGRC and IGC estimates from the existing literature (reported by Van Der Weide et al. (2023) and Dendir (2023)).

Third, consistent with evidence from developed countries, the estimated share of intergenerational association between fathers and children in sibling correlation is small according to the classic methods, with the highest estimate of only 33 percent (Bjorklund et al. (2010) method).[18] The share of fathers-children association is considerably higher when we use the Bingley and Cappellari (2019) method to relax the homogeneity and independence assumptions implicit in the classic methods of decomposition.[19] The estimates from the Bingley and Cappellari (2019) ap-

[13] All the average estimates reported in this paper are weighted by the number of observations across different estimation samples. Also, note that a higher estimate implies a lower relative mobility.

[14] The 56 estimates are for the same birth cohorts as our estimation sample. Bjorklund and Salvanes (2011) report a range of 0.40-0.60 for developed countries with the estimates for the United States among the highest. Prag et al. (2019) report an average of 0.49 from a meta analysis of the studies on sibling correlation in income and education published between 1972-2018 (includes both developing and developed countries).

[15] The corresponding rank correlations for IGC are a bit higher.

[16] See, for example, Van Der Weide et al. (2023), Neidhofer et al. (2018), Razzu and Wambile (2022), Azomahou and Yitbarek (2021), and Dendir (2023).

[17] It is, however, important to note that part of the differences from the existing studies is due to differences in data sources and age restrictions imposed to define the sample. For example, the estimates of Van Der Weide et al. (2023) do not use the DHS data, and are based on children of age 21-25 years in the survey year. We, however, do not report estimates for the 21-25 age range because the sample size in many countries become too small for credible estimation.

[18] The average is 30 percent according to the Solon (1999) method, and 18 percent according to the Mazumder (2008) method.

[19] Bingley and Cappellari (2019) method also relaxes the normality assumption. They analyze intergenerational income mobility in Denmark, and provide evidence of a high share of intergenerational income elasticity in sibling

proach suggest an average share of 73 percent across 53 countries, and in some countries, the share is higher than 80 percent (many of them in Sub-Saharan Africa). Our evidence thus suggests that the widely-shared conclusion in the existing literature (see, for example, Bjorklund and Salvanes (2011) and Solon (1999)) that the main mechanisms of children's educational opportunities are not correlated with parental education is likely to be an artifact of the linearity assumption in the estimation of parents-children association.

In contrast, the estimates across birth cohorts show that the share of fathers-children association has declined in many countries from the 1970s to the 1990s birth cohort. There are 13 countries where the share has increased over the decades, many of them (11) are located in the Sub-Saharan Africa region. In some cases, a declining trend in the share of parents-children association contrasts with an increasing trend in sibling correlation. This highlights the need for policies to address the worsening overall educational opportunities despite a weakening influence of parental education.

The rest of the paper is structured as follows. Section (2) discusses the related literature and puts the contributions of this paper in perspective. Section (3) is devoted to the conceptual framework that describes the measure of sibling correlation and the decomposition methods for estimating the share of intergenerational association in sibling correlation. A special focus here is on the Bingley and Cappellari (2019) approach. Section (4) discusses the advantages of the Demographic and Health Surveys for our cross-country analysis and provides a brief discussion of the estimation methods. Section (5), arranged in a number of subsections, reports and discusses the estimates of sibling correlation. Section (6) discusses the estimates of the share of the intergenerational association across regions and countries, and traces out the evolution over time from the 1970s birth cohort to the 1990s birth cohort. Section (7) deals with the question whether cross-country rankings and mobility trends across cohorts vary substantially between sibling correlation and IGRC and IGC estimates. The paper ends with a summary of the results and the contributions of the paper in the conclusions.

2 Related Literature

The economics literature on intergenerational mobility is grounded in the seminal contributions of Becker and Tomes (1979) and Becker and Tomes (1986) that developed a model of intergenerational persistence in permanent income focusing on the role of human capital. The inequality of opportunity strand of the literature builds on the political philosophy foundation of the theory of distributive justice (see Roemer (1998)). The inequality of opportunity focuses on the "circumstances" a child is born into, and emphasizes that inequality due to the circumstances is unjust and should be the focus of policy interventions. Although these two approaches grew largely independently, there

correlation in income.

has been a growing appreciation that they deal with fundamentally the same question.[20] These two approaches can be best viewed as complementary. The IOP provides a theory of justice foundation, but does not identify the economic mechanisms which could be the policy levers. The Becker-Tomes model identifies a set of such economic mechanisms highlighting the roles of credit constraints and returns to education. The sociological literature uses occupational prestige and class mobility with a focus on the long-term factors including the role of formal and informal institutions, especially in the labor market (see Torche (2015a) and Breen (2010)).

As noted in the introduction, the literature on developing countries mainly focuses on intergenerational educational mobility because of the paucity of long panel data on income. Although there is a growing literature on the persistence of educational attainment across generations at the country level, the studies that attempt to provide comparable estimates across developing countries remain limited.[21] The most widely-cited cross-country analysis of intergenerational educational mobility is Hertz et al. (2008) that provides estimates of relative mobility using IGRC and IGC between fathers and children for 42 countries.[22] Neidhofer et al. (2018) report estimates of a number of measures of absolute and relative educational mobility for 18 Latin American countries. Drawing on a variety of household surveys, Van Der Weide et al. (2023) provides estimates of a number of absolute and relative educational mobility measures covering 153 countries.[23] A number of recent papers focus on Sub-Saharan African countries, see, for example, Alesina et al. (2021), Azomahou and Yitbarek (2021), and Razzu and Wambile (2022).[24] Perhaps, more importantly, all the cross-country studies noted above rely on parental education as an indicator of children's socioeconomic status and focus on the intergenerational association between parents' and children's schooling, and none report estimates of sibling correlation. We provide complementary evidence on the geography and evolution of intergenerational educational mobility in the developing world by estimating sibling correlation and the share of the parents-children schooling association in sibling correlation.

In more than two decades following the publication of the handbook of labor economics chapter

[20] See, for example, the discussion by Deutscher and Mazumder (2023) and Bjorklund and Jantti (2020).

[21] At the individual country level, recent contributions on intergenerational educational mobility in developing countries include Kundu and Sen (2022), Azam and Bhatt (2015), Azam (2016), Asher et al. (2024), Emran and Shilpi (2015) on India, Fan et al. (2021), Emran and Sun (2015) on China, Emran et al. (2023) for a comparative analysis of India and China, Torche (2015b) on Mexico, Assaad and Saleh (2018) on Jordan; Ahsan et al. (2023), Ahsan et al. (2024) on Indonesia. For surveys of this literature, please see Iversen et al. (2019), Torche (2019), and Emran and Shilpi (2021).

[22] On April 5, 2025, Google scholar citation count was 997.

[23] Many of the surveys such as living standards measurement study (LSMS) used in some of the cross-country studies do not include nonresident children of household heads, but include their nonresident parents. Note that having information on nonresident parents is not useful for estimating sibling correlation as there are no data on the siblings of household head.

[24] These studies rely on census data from IPUMS International, a data repository for micro census data from across the world. To reduce coresidency bias, Alesina et al. (2021) focus on the sub-sample of 14-18 years old children.

by Solon (1999), there have been only a few studies on developing countries that use sibling correlation as a measure of educational mobility. The most widely cited study of sibling correlation in developing countries is Dahan and Gaviria (2001) which reports estimates of sibling similarity in lack of grade progression (a measure of educational failure) for 16 Latin American countries. This makes it difficult to compare them with the estimates based on schooling attainment (years of schooling). More importantly, they do not follow the methodology developed in Solon et al. (1991), and Solon (1999). They construct an index of sibling similarity based on the index of segregation proposed by Kremer and Maskin (1996). Their estimates are thus not comparable to the other estimates of sibling correlation in the literature, including the estimates reported in this paper.[25]

In contrast, the literature on sibling correlation in education and income in developed countries is substantial with contributions from both economists and sociologists (Solon et al. (1988), Bjorklund et al. (2010), Hauser and Mossel (1985), Grätz et al. (2021), Lundberg (2020), Anger and Schnitzlein (2017), Collado et al. (2023), and Anderson et al. (2024)). Given the focus of the economic literature in developed countries on income, many of the existing studies provide estimates of sibling correlation in income. But the literature on sibling correlation in education is also sizeable. Most of the estimates of sibling correlation in schooling in developed countries fall in the range of 0.40-0.60 (see Bjorklund and Salvanes (2011)). Among the recent contributions, Grätz et al. (2021) report estimates of sibling correlation in education for 6 developed countries with an average estimate of 0.44, the lowest estimate of 0.36 (Finland) and the highest 0.51 (United States and Germany).

3 Conceptual Framework

3.1 Sibling Correlation

For the estimation and interpretation of sibling correlations, we adopt a conceptual framework that has been the workhorse in the empirical literature on sibling correlations (see, Solon et al. (1991), Solon (1999), Bjorklund et al. (2002), Bjorklund and Lindquist (2010), Mazumder (2008), (2011)). Following Solon (1999) and Bjorklund et al. (2010), we begin with a simple model of children's educational attainment:

$$\tilde{S}_{if} = \mu + \Gamma X_i + a_f + b_{if} \tag{1}$$

[25]In a meta analysis of sibling correlation estimates published between 1972-2018, Prag et al. (2019) identify only two studies on developing countries including that of Dahan and Gaviria (2001), the second study is on intergenerational educational mobility in post-reform India by Emran and Shilpi (2015).

Where $\tilde{S}_{if}$ is a measure of educational attainment, usually years of schooling, of sibling i in family f, μ is the country specific component that captures the factors common to all children of a country, and X_i is a set of individual characteristics, elements of which depend on the purpose of the analysis. Following Bjorklund et al. (2010), we include a gender dummy, and, following Bingley and Cappellari (2019), we include cohort dummies, but no other controls are included in X_i. In this framework, a_f is the family and neighborhood component shared by all siblings in family f, and b_{if} is the individual specific component for sibling i capturing i's deviation from the common family and country components. We define demeaned years of schooling S_{if} as follows:

$$S_{if} = \tilde{S}_{if} - (\mu + \Gamma X_i) = a_f + b_{if} \tag{2}$$

The focus of the analysis is on the importance of the family and neighborhood component a_f in explaining the variance in demeaned years of schooling S_{if}.[26] As discussed earlier, a_f captures all observed and unobserved family and neighborhood factors shared by siblings, in addition to parental education. The country mean μ represents the "growth and structural change" in a country that influence all children the same way irrespective of their family background. The cohort dummies take out the cohort specific effects shared by the children of a cohort, but may vary across different cohorts. The inclusion of the country and cohort specific intercepts in the vector X_i implies that the measure of mobility based on sibling correlation in demeaned schooling refers to *relative* rather than *absolute* mobility. Assuming that a_f is independent of b_{if}, the variance of S_{if} (denoted as σ_s^2) can be expressed as the sum of variances of the family and neighborhood component (denoted as σ_a^2) and the idiosyncratic individual component (denoted as σ_b^2):

$$\sigma_s^2 = \sigma_a^2 + \sigma_b^2 \tag{3}$$

The sibling correlation in education (denoted by ρ_s) then can be expressed as:

$$\rho_s = \frac{\sigma_a^2}{\sigma_a^2 + \sigma_b^2} \tag{4}$$

Sibling correlation thus estimates the share of variance of children's education that can be attributed to common family and neighborhood background. The higher the share of family and neighborhood background, the higher is the estimate of sibling correlation and the lower is the degree of intergenerational mobility. As it is calculated as a share of variance of children's schooling, it normalizes the differences in cross-sectional educational inequality in children's generation across countries. Sibling correlation is a measure of mobility (more precisely immobility) because the family and neighborhood factors shared by the siblings growing up together are not chosen by themselves, but they are born into it. Thus, it is consistent with the inequality of opportunity foundation of distributive justice (Roemer (1998), Coleman (1968)).

[26] In the variance components analysis, a_f is usually called the family component as it represents the family fixed effect.

A fundamental insight of the Becker and Tomes (1986) model is that imperfections in the credit market lead to lower mobility. This also holds for sibling correlation. When the credit market is perfect and parents can borrow at a given interest rate r to finance children's education, optimal investment is independent of family background and depends only on the ability of a child. Under the assumption that the distribution of innate ability does not depend on family background, the variance in the average education of children across families captured by σ_a^2 would be approximately zero. Now, consider the credit market imperfections model of Becker et al. (2018) where the poor (less educated) parents have access to credit market for children's education, but have to pay a higher interest rate, and the rich (and highly educated) pay a lower interest rate: $r_l > r > r_h$ with subscripts l and h referring to low educated and high educated parents. In this case, r represents the interest rate faced by the families in the middle of the distribution. Parents in the low educated families optimally invest less in children's education at a given ability level, and the average education of siblings increases with the level of parental education. This increases the variance in children's schooling across families, thus making σ_a^2 and sibling correlation positive. Note that the strength of sibling correlation increases with the degree of credit market imperfections as captured by differences in the interest rates faced by different households. The important point here is that sibling correlation as a measure of mobility has two desirable features: (i) it is consistent with the main insights of the Becker-Tomes model, and (ii) it is grounded in the political philosophy foundation of theory of justice developed by Roemer (1998).

Robustness of Sibling Correlation to Coresidency Bias

A critical advantage of sibling correlation for our analysis is that it provides reliable estimates in coresident samples. This is important for understanding intergenerational mobility in developing countries because most of the available data sets have only the coresident household members. In this section, we provide a discussion on the theoretical insights into and empirical evidence on why sibling correlation estimates are robust to coresidency bias. For a more complete discussion, please see Ahsan et al. (2025).

From equation (4), sibling correlation is given by the formula: $\rho_s = \frac{\sigma_a^2}{\sigma_s^2}$. So the magnitude of the bias depends on how sample truncation due to coresidency affects the numerator σ_a^2, and the denominator σ_s^2 of the formula for sibling correlation. Since sample truncation usually takes the form of children missing systematically from the tails of the distribution, coresidency, in general, causes downward bias in both the numerator and the denominator (Greene (2005), Cohen (1991)). Thus, the bias in the denominator largely cancels out the bias in numerator, and the net bias is small.

To see how sample truncation affects the numerator and the denominator, it is instructive to consider the case discussed in Ahsan et al. (2025) where sample truncation occurs because children are missing from the right tail of the distribution. The children from the highly educated household are nonresident as they are in college at the time of survey enumeration. Since college educated children are missing, it cuts the right tail of the distribution of children's schooling, reducing the variance. This implies that the estimate of σ_s^2 is downward biased in this case. Equally important, such truncation also biases the estimate of σ_a^2 downward. This follows from the fact that σ_a^2 is estimated as the variance of the average schooling of siblings across different households. As we are missing the most educated children from the households with educated parents, the average schooling of siblings in these households is lower, which cuts the right tail of the distribution of the average schooling of siblings, making σ_a^2 smaller in a coresident sample.

3.2 Intergenerational Correlation vs. Sibling Correlation

Given that there is a large literature on intergenerational persistence in education between parents and children, a natural question to ask is how much of the sibling correlation can be accounted for by the intergenerational association between a parent's (usually father's) and children's schooling. A simple approach to understanding the role of the parents-children association in life outcomes is to estimate sibling correlation with and without conditioning on parental outcome. Mazumder (2008) uses this approach to estimate the share of intergenerational income elasticity (IGE) in sibling correlation in income in the United States. Emran and Shilpi (2015) adopts this approach to estimate the share of fathers-children association in sibling correlation in schooling in post-reform India.

A second and more widely used approach was developed earlier by Solon (1999). Following Solon (1999) and Bjorklund et al. (2010), we can derive the relation between sibling correlation and parents-children association as measured by intergenerational correlation (IGC). We can decompose the family and neighborhood component a_f into two orthogonal parts:

$$a_f = \beta S_f^p + \lambda_f^R \tag{5}$$

where βS_f^p is the part due to parental education and λ_f^R is the residual sibling effect. Taking variance of equation (5), we have:

$$\sigma_a^2 = \beta^2 \sigma_p^2 + \sigma_{\lambda R}^2 \tag{6}$$

Dividing through by σ_s^2 we get:

$$\rho_s = \frac{\beta^2 \sigma_p^2}{\sigma_s^2} + \frac{\sigma_{\lambda R}^2}{\sigma_s^2} = IGC^2 + Residual\, Sibling\, Correlation \tag{7}$$

Residual sibling correlation represents all other factors shared by siblings but are uncorrelated with parental education. Note that if we assume stationary distributions (i.e., $\sigma_s^2 = \sigma_p^2$), then equation (7) becomes: $\rho_s = \beta^2 + \frac{\sigma_{\lambda R}^2}{\sigma_s^2} = IGRC^2 + Residual\, Sibling\, Correlation$. Many studies on intergenerational mobility in developed countries used equations (7) (with or without stationarity assumption), and the conclusion from this literature is that only a small part of sibling correlation could be explained by parental education. For example, consider the estimates for years of schooling reported by Bjorklund and Jantti (2020), the IGC estimate for Sweden is 0.30 and sibling correlation is 0.43. The squared IGC is thus 0.09, only about 20 percent of sibling correlation is explained by IGC. When only 20 percent of the sibling correlation can be explained by parental education, it is difficult to escape the conclusion that the focus of policy and research should be on the wider family (non-parental) and neighborhood factors (see the discussion by Solon (1999) and Bjorklund and Salvanes (2011)).

However, equation (5) is motivated by the workhorse linear mobility equation for estimating IGC which imposes a number of assumptions that are likely to be rejected on both theoretical and empirical grounds. Recent theoretical models suggest that the assumption of linearity is likely to be violated in many cases. Becker et al. (2015) develop a model of intergenerational educational association between parents and children where the mobility equation can be concave (due to diminishing returns) or convex (due to complementarities).[27] A concave or convex intergenerational association equation has two important implications: (i) the influences of parents on children as captured by IGRC (β) are heterogeneous across families; and (ii) the parameter β can be positively (for convex mobility function) or negatively (concave mobility function) correlated with parental education. Bingley and Cappellari (2019) develop a decomposition method that allows for heterogeneous β and arbitrary correlation between β and S_f^p. They find that, for sibling correlation in income, relaxation of the implicit assumptions in equation (5) makes a big difference in Denmark: about 70% of the sibling correlation in income can be attributed to parents-children association in income.

To our knowledge, our study is the first to implement the Bingley and Cappellari (2019) approach for estimating the intergenerational share in sibling correlation in education, and we do it for a large number of developing countries (53 countries) using comparable data from the DHS surveys. We provide a brief discussion of the Bingley and Cappellari (2019) approach below, and refer the reader to the original paper for details.

[27]Recent evidence suggests that the intergenerational educational mobility equation is not linear in most of the cases. Emran et al. (2020) finds that the mobility equation in India is concave irrespective of gender. Ahsan et al. (2022) provides evidence suggesting concave or convex mobility equations for years of schooling in China, India, and Indonesia.

3.3 Decomposition of Sibling Correlation without Restrictive Assumptions: Bingley and Cappellari (2019) Approach

In the context of our set-up, Bingley and Cappellari (2019) replace equation (5) by the following random coefficient specification:

$$a_f = \left(\bar{\beta} + \beta_f\right) S_f^p + \lambda_f^R \tag{8}$$

where $\bar{\beta}$ is the average influence of parental education across families, and β_f is deviation of family f from the mean. This specification thus incorporates heterogeneity across families in the influences of parental education captured by the parameter β_f. If we relax only the heterogeneity assumption but retain the assumption that the magnitudes of the parental influence is independent of the level of parental education, we have the following decomposition:

$$\rho_s = \frac{\left(\bar{\beta}^2 + \sigma_\beta^2\right)\sigma_p^2}{\sigma_s^2} + \frac{\sigma_{\lambda R}^2}{\sigma_s^2} \tag{9}$$

But as we discussed above, there are plausible theoretical models that suggest that β_f is correlated with S_f^p. Using a result on the exact variance of the product of two random variables due to Bohrnstedt and Goldberger (1969), Bingley and Cappellari (2019) derive the following decomposition (under normality):

$$\rho_s = \frac{\left(\bar{\beta}^2 + \sigma_\beta^2\right)\sigma_p^2 + cov\left(\beta_f S_f^p\right)^2}{\sigma_s^2} + \frac{\sigma_{\lambda R}^2}{\sigma_s^2} \tag{10}$$

Since $cov\left(\beta_f S_f^p\right)^2 \geq 0$, the maintained assumption of independence in equation (9) will in general *underestimate* the role of the intergenerational association of schooling. The evidence on intergenerational income mobility in Denmark reported by Bingley and Cappellari (2019) suggests that the relaxation of the independence assumption is especially important; the estimated share of the intergenerational component (father's income) increases substantially as a result.

The decomposition in equation (10), however, relies on the normality assumption which is rejected by the data in most of the cases. Bingley and Cappellari (2019) find that imposing normality tends to underestimate the share of intergenerational influences in sibling correlation. They relax the normality assumption by using an unrestricted form of the intergenerational correlation between the children and parents. In our empirical analysis, we will report estimates from both the classic methods (Bjorklund et al. (2010), Mazumder (2008), Solon (1999)), and the method due to Bingley and Cappellari (2019).

4 Data and Estimation Methods

A major hurdle for credible cross-country ranking of inequality of opportunity and intergenerational mobility is that data from different surveys may not be comparable. As noted earlier, the survey instruments used for education information by DHS are standardized across countries which makes the data much more comparable. We take the schooling information for children and their fathers from the household roster which is the same in all DHS surveys.

There are 53 countries in our sample. We use 277 waves of DHS surveys to build our data base. The list of the countries and the waves used for our analysis are reported in appendix Table A0. We exclude 42 countries where at least one DHS survey is available but the sample size is small. The cut-off for inclusion is a minimum of 1,000 observations in the sample. The trade-off between country coverage and sample size is well-appreciated in the literature. For a recent analysis of intergenerational educational mobility covering a large number of countries (153), see Van Der Weide et al. (2023), but, as noted earlier, they do not provide estimates of sibling correlation.

In each wave of DHS, our sample includes children of age 16-28 years in the survey year.[28] In the online appendix, we also report estimates for the children of age 18-25 and 20-28 years in the survey year. The exclusion of relatively older age cohorts in each wave is motivated by two considerations. First, evidence suggests that coresidency bias in sibling correlation is smaller for the younger cohorts (Ahsan et al. (2025)). Second, it is better to exclude children who are born far apart as they are likely to face different family, neighborhood, and school environments (Bjorklund and Salvanes (2011)).

Among our 53 countries, there are 4 countries with fewer than 2,000 observations, and 30 countries with sample sizes more than 5,000. The total number of observations in our data set is 724,192. The country level estimation samples include children from the 1960s to 1990s birth cohorts. But in many countries, the number of observations for the 1960s birth cohort is small because only a limited number of DHS surveys were administered in these countries in the 1990s and earlier. For the analysis of the evolution of educational mobility across cohorts we thus do not include the 1960s observations, and focus on the three decade wise birth cohorts from the 1970s to the 1990s.[29]

Online appendix Table A1 reports the summary statistics for the estimation sample at the country level. The average level of education is the highest in Europe and Central Asia region, and the lowest average is observed in the Sub-Saharan African countries. This is true for both the

[28] The 12 years age range is also used by Bingley and Cappellari (2019).

[29] Hertz et al. (2008) provide estimates of IGRC and IGC for the 1930s to 1970s birth cohorts, and Van Der Weide et al. (2023) report estimates of absolute and relative mobility based on parents-children association for the 1950s to the 1980s birth cohorts.

children's and parents' (fathers') generations. The education level is also low in South Asia region, but substantially higher than that in many Sub-Saharan African countries. The percentage gains in years of schooling in the children's generation (relative to the parents) are the highest in many Sub-Saharan African and South Asian countries, because of the very low level of education in parental generation in these regions. Within-region heterogeneity is also substantial, especially in the Sub-Saharan Africa: the average years of schooling in Burkina Faso is 4.40 years for children and 1.31 years for fathers, while the corresponding averages for South Africa are 9.81 years (children) and 6.78 years (fathers).

The estimation method adopted by Bingley and Cappellari (2019) is the method of moments. The data requirements for the analysis are more demanding because the Bingley and Cappellari (2019) approach is based on family triads with the father and two children in a family. We take the oldest two children from those families where the number of children is more than 2. To ensure that the siblings are not too far apart, we follow Bingley and Cappellari (2019) and restrict their age gap to a maximum of 12 years. The intergenerational association is estimated nonparametrically as the average of the persistence between father and the first child, and between father and the second child in the sample. The birth cohorts are defined based on the birth year of the older sibling in a household. For the estimation of the share of intergenerational component, we do not impose the stationary distributions assumption across generations used by Bingley and Cappellari (2019) as this assumption is rejected by our data.[30] We also find that the estimated share can be more than 100 percent if we incorrectly impose stationary distribution assumption within the Bingley and Cappellari (2019) approach. The estimates from the Mazumder (2008) method for the share of intergenerational component are implemented using Restricted Maximum Likelihood (REML) in a mixed effects model.

5 Evidence: Geography of Sibling Correlation and Evolution over the 1970s-1990s Birth Cohorts

Our analysis below is based on the 16-28 years old children in a survey year. We check if the main conclusions are robust in 20-28 years age range, and 18-25 years age range. The 20-28 years sample addresses the concern that some children may not have completed schooling at age 16 or 18 years. The 18-25 years sample is motivated by the observation that the coresidency rates may be substantially smaller for the older children (26-28 years). The estimates of parameters of interests are nearly indistinguishable across different samples (see appendix Figures A1-A4 and

[30]In the income data used by Bingley and Cappellari (2019), the null hypothesis of stationary distributions is not rejected. Stationary distributions are also assumed by Solon (1999).

appendix Tables A8-A11). The conclusions from these alternative samples are consistent with the conclusions below.

5.1 Geography of Sibling Correlation across Regions and Nations

The estimates suggest that there are substantial regional variations in intergenerational educational mobility as measured by sibling correlation. Figure 1 presents the average sibling correlation estimates for six regions of the world. The country specific estimates are reported in Table 1. The estimates suggest that intergenerational educational mobility for the 1960s-1990s birth cohorts is the lowest in the Latin American and Caribbean countries with an average sibling correlation of 0.63.[31] Compare this with an average of 0.41 for developed countries noted before. This evidence on Latin America and Caribbean is interesting as the countries in this region also experienced some of the highest income inequality during this period (De Ferranti (2004)). Thus, high cross-sectional inequality was coupled with low intergenerational mobility, a doubly undesirable distributional outcome. Among the countries in this region, Guatemala has the unfortunate distinction of having the highest sibling correlation in schooling: 0.71, and the country with the lowest sibling correlation is the Dominican Republic with an estimate of 0.57.

Intergenerational educational mobility is also low (comparable to Latin America) in East Asia and South Asia, with an average sibling correlation of 0.61 in both regions.[32] Among the East Asian countries, Vietnam has the lowest intergenerational educational mobility, with a sibling correlation estimate of 0.66. The Philippines has the best educational mobility in this region with an estimated sibling correlation of 0.57. In South Asia, the estimates are very close in four out of five countries, ranging from 0.61 (Bangladesh and India) to 0.64 (Nepal). Afghanistan enjoys the highest intergenerational educational mobility with an estimate of 0.57.

We have two countries from the Middle-East and North Africa region for which the required DHS data were available: the Arab Republic of Egypt and Jordan.[33] The estimate suggests that sibling correlation is much lower compared to the three regions discussed above (Latin America and Caribbean, South Asia, and East Asia and Pacific). Sibling correlation in schooling is 0.50 in Jordan and 0.54 in Egypt which are smaller than, for example, the estimate for the most mobile country in South Asia, Afghanistan (0.56).

For Sub-Saharan Africa, we have 30 countries (please see Table 1 for the list of the countries),

[31] Recall that a higher estimate of a relative mobility measure such as sibling correlation, IGRC, and IGC implies a lower educational mobility. The countries from this region in our sample are: Bolivia, Brazil, Colombia, Dominican Republic, Guatemala, Haiti, and Peru.

[32] Our East Asia sample includes Cambodia, Indonesia, Philippines, and Vietnam. The South Asia sample includes Afghanistan, Bangladesh, India, Nepal, and Pakistan.

[33] As discussed in the data section, we excluded the countries with DHS survey if the sample size is less than 1,000 observations.

with an average sibling correlation of 0.59. On average, Sub-Saharan Africa is more mobile than Latin America, South Asia and East Asia, but the mean estimate hides substantial heterogeneity across countries. The highest estimate is 0.76 for Madagascar which is also the highest among our 53 countries. Chad (0.73) and Nigeria (0.70) also have high sibling correlation estimates. The lowest estimate is 0.49, for South Africa.

The region with the highest intergenerational educational mobility is Europe and Central Asia; the average sibling correlation is 0.50. This average estimate is larger than the average of 0.44 for 6 developed countries reported by Grätz et al. (2021).[34] Among the 5 countries from this region in our sample, Kyrgyz Republic comes out at the top in educational mobility with an estimated sibling correlation of 0.38 which is also the lowest among the 53 countries in Table 1. Türkiye (previously known as Turkey) and Armenia share the unfortunate distinction of the lowest intergenerational mobility in this region with an estimated sibling correlation of 0.53.

5.2 Evolution Over Time: Estimates for the 1970s to the 1990s Birth Cohorts

As noted earlier, in many countries, the sample size for the 1960s birth cohort is too small for credible estimation of sibling correlation. We thus focus on the three decade-wise birth cohorts, from the 1970s to the 1990s.[35] The children born in the 1970s likely faced significantly different economic and educational policies when compared to the children born in the later decades. There were two major policy developments in the 1980s and the following decades that might have affected the educational opportunities of children. First, economic liberalization including trade liberalization, privatization and deregulation yielded impressive economic growth and substantial reductions in poverty in many countries, but at the same time increased income inequality (World Bank (2006)). Second, there were dramatic expansion of schools in many developing countries. Many countries also implemented compulsory primary and secondary schooling in the decades of 1980s-2000s. Did the poverty reduction and the expansion of schooling and other educational policies outweigh the adverse effects of inequitable growth? Are there important regional differences in the evolution of inequality of educational opportunities over these decades? The evidence presented below on these questions lays the groundwork for a future research agenda to study the causal effects of public policies by focusing on the relevant countries and cohorts which experienced substantial changes in sibling correlation.[36]

[34]The developed countries in Grätz et al. (2021) are: Finland, Norway, Germany, United States, United Kingdom, and Sweden. The countries in our sample are: Albania, Armenia, Kyrgyz Republic, Tajikistan, and Turkiye.

[35]Earlier studies provide estimates of parents-children association for different birth cohorts. Hertz et al. (2008) report estimates of IGRC and IGC for 1930s-1970s birth cohorts. Van Der Weide et al. (2023) present estimates for 1950s-1980s birth cohorts. But they do not report any estimates of sibling correlation.

[36]For evidence on the causal effects of school construction on intergenerational mobility, see Mazumder et al. (2019) and Ahsan et al. (2023).

Figure 2 presents the estimates of sibling correlation for the six regions disaggregated by the decade of birth (1970s-1990s birth cohorts).[37] The country-specific estimates are reported in Table 2.[38] The first impression that jumps out of Figure 2 is that there are substantial regional heterogeneity in the evolution of inequality of educational opportunity. Of the 6 regions, 2 show monotonic improvements over the three decades, they are Latin America and Caribbean, and East Asia and Pacific. The largest decline in sibling correlation is experienced in the East Asia and Pacific region (16.92 percent reduction, from 0.65 in the 1970s to 0.54 in the 1990s), with Latin America and Carribean also achieving a substantial decline (11.94 percent reduction, from 0.67 (1970s) to 0.59 (1990s)). The substantial improvements in intergenerational educational mobility in Latin American countries is a welcome development because of its historically high income inequality levels (De Ferranti (2004)).

Middle East and North Africa stands out as the only region where we observe a monotonically increasing average sibling correlation from the 1970s birth cohort to the 1990s birth cohort.[39] Although sibling correlation was low for the 1970s cohort in these countries (0.50), it increased by 12 percent to 0.56 in the 1990s cohort which is close to the estimate of 0.59 for the Latin America and Caribbean region for the same birth cohort.

In contrast, the changes in sibling correlation in South Asia and Sub-Saharan Africa are not monotonic across different birth cohorts. More important, the magnitudes of changes are rather small: a less than 2 percent decline in the sibling correlation estimate from the 1970's cohort to the 1990's cohort in both regions. This picture of stagnation in South Asia, however, conceals important heterogeneity; for example, the trajectories of change over time are opposite in Bangladesh vs. Pakistan. Sibling correlation declined substantially in Bangladesh from 0.67 in the 1970s cohort to 0.60 in the 1990s cohort, while Pakistan experienced a substantial increase from 0.61 in the 1970s to 0.69 in the 1990s cohort (see Table 2). Evidence on India, by far the largest country in the region, suggests that intergenerational mobility remained largely unchanged over the three decades. This is striking because following extensive economic reforms including dramatic trade liberalization and domestic deregulation in 1991, India reaped impressive economic growth and poverty reduction in the decades of 1990s and 2000s during which the children of the 1980s and 1990s birth cohorts went to school.[40] This raises the question whether liberalization policies might

[37] The countries in a region in Figure 2 may vary from Figure 1, as we included only those countries for which estimates for all three decades are available. For example, Figure 2 does not include Brazil where the last DHS survey was done in 1986, and as a result, we do not have enough observations for the 1980s and 1990s birth cohorts.

[38] Because of space constraint, Table 2 does not report the standard errors and the number of observations which are available in the online appendix Tables A2 (1970s birth cohort), A3 (1980s birth cohort), and A4 (1990s birth cohort).

[39] A caveat here is that we have two countries from this region in our sample, and the average estimate may not be representative of other countries of this region. But Egypt is by far the largest country in the region. These countries have about 20 percent of the region's population.

[40] Based on Indian government official poverty line, the proportion of poor people in rural areas declined from 47 percent in 1983 to 28 percent in 2004-2005. The corresponding decline in urban India is from 42 percent in 1983 to

have failed to improve educational opportunities for the children, an answer to which requires that future research agenda focus on these cohorts of children in India.

As noted earlier, Sub-Saharan Africa as a region also did not experience any substantial improvements over the three decades. Again, the average estimates conceal substantial country level diversity in mobility experiences as the estimates in Table 2 show. We observe some of the most dramatic worsening of intergenerational educational mobility in this region. For example, sibling correlation in Mozambique increased from 0.52 in the 1970s cohort to 0.68 in the 1990s cohort, and in Nigeria from 0.63 (1970s) to 0.74 (1990s). There are also a number of countries in this region that experienced substantial improvements. For example, sibling correlation in Uganda declined from 0.64 (1970s) to 0.55 (1990s), and in Mali, from 0.63 (1970s) to 0.57 (1990s). Out of 25 countries in this region for which we have estimates for both the 1970s and the 1990s cohorts, 17 countries registered improvements, while 8 experienced a setback in intergenerational educational mobility.

6 How Long is the Father's Shadow? Estimating the Share of Fathers-Children Association in Sibling Correlation

To understand the importance of intergenerational association between fathers and children, we primarily rely on the Bingley and Cappellari (2019) approach. For comparison, we also report estimates from two classic methods widely used in the existing literature: Bjorklund et al. (2010), and Mazumder (2008). For estimating the share of fathers-children association, we do not impose the stationarity assumptions on the schooling distributions across generations, and rely on the IGC estimates (rather than IGRC which imposes the stationarity assumption).[41] This choice is dictated by two considerations. First, as discussed earlier, the stationary distribution assumption is rejected by our data. Second, as noted earlier, evidence suggests that coresidency bias in IGC is small, much smaller than that in IGRC. Emran et al. (2018) discuss a theoretical rationale for the finding that IGC suffers much less from sample truncation due to coresidency. This can be seen from following relationship discussed by Solon (1999): *IGC = IGRC× (standard deviation of fathers' schooling)/(standard deviation of children's schooling)*. In a coresident sample, IGRC is biased *downward*, but the estimate of the ratio of standard deviations is biased *upward*. As a result, the bias in IGC is lower. For details, please see the discussion by Emran et al. (2018).

We focus on the comparison of the estimates from Bjorklund et al. (2010) and Bingley and

26 percent in 2004-2005. See World Bank (2011).

[41] We also use the Solon (1999) method that imposes stationarity and relies on IGRC to estimate the share. However, we do not discuss those estimates because the IGRC estimates are biased downward in coresident data. The estimates are available upon request.

Cappellari (2019) methods. For the following discussion, we use "fathers-children share" as a short for the share of fathers-children schooling association in sibling correlation in schooling.

6.1 Geography of the Fathers-Children Share

Figure 3(A) presents the estimates of the fathers-children share in sibling correlation for our six regions based on the Bingley and Cappellari (2019) method. The corresponding shares from the Bjorklund et al. (2010) method are in Figure 3(B). A comparison of these two methods suggests three major conclusions. First, the estimates from the Bingley and Cappellari (2019) approach are much larger: the lowest estimate is 0.70 (MENA region), while the highest estimate from the Bjorklund et al. (2010) approach is only 0.37 (East Asia and Pacific). The average parents-children share for the 53 countries is 73 percent according to the Bingley and Cappellari (2019) approach, while it is only 33 percent according to the Bjorklund et al. (2010) approach.[42] This is consistent with the evidence on income mobility in Denmark reported by Bingley and Cappellari (2019), and vindicates, in a much wider context, their argument that the low estimates in the existing literature are driven by restrictive homogeneity and independence assumptions. Second, the ranking of regions may change depending on the method of decomposition used. For example, according to the Bjorklund et al. (2010) method, the share of fathers-children association is larger in Latin America and Carribean than that in Sub-Saharan Africa. But the share is higher in Sub-Saharan Africa according to the Bingley and Cappellari (2019) estimates.

The disaggregated country level estimates of the fathers-children share are reported in Table 3 using the Bingley and Cappellari (2019) method. The estimated share is high in most of the countries (more than 60% in every case), and there are some countries where 80% or more of the sibling correlation can be attributed to the intergenerational association between father and the children: Vietnam (82%) in South East Asia, Pakistan (81%) in South Asia, and Benin (82%), Cameroon (85%), the Republic of Congo (86%), Madagascar (83%), Mozambique (82%), and Togo (83%) in Sub-Saharan Africa. Interestingly, none of the countries in the Latin America and Caribbean region have such a high share of fathers-children association even though some of these countries have very high sibling correlation.

6.2 The Evolution of the Fathers-Children Share

We next look at the evolution of the share of fathers-children association in schooling across the three birth cohorts in the six regions. Figure 4 presents the results based on the Bingley and Cappellari (2019) method. It is striking that in every region, the share of fathers-children

[42]The estimates from the other two traditional methods are even lower, and in particular, the method due to Mazumder (2008) seems to yield very low estimates.

association declined from the 1970s cohort to the 1990s cohort, even though in some cases the magnitude is negligible (for example, Sub-Saharan Africa where the share was 76% in the 1970s and 73% in the 1990s). This can be interpreted as a declining role of parents (fathers) in shaping the educational opportunities of children over time.

The evolution of the share over time offers some contrasting patterns when compared to the evidence on sibling correlation across cohorts discussed earlier. The share of the fathers-children association declined substantially in South Asia despite very little changes in the sibling correlation. In the Middle East and North Africa region, the fathers-children share declined dramatically from 0.79 (1970s) to 0.57 (1990s) which stands in sharp contrast to the monotonically increasing magnitudes of sibling correlation. This suggests that the subset of socioeconomic factors which are uncorrelated with father's education evolved in a way to restrict the educational opportunities of children even though the influences of the fathers weakened substantially over time. An important implication is that the focus of the future research and policy in these countries should be on those family and neighborhood factors which are not related to parental education.

The individual country level estimates of the intergenerational share across cohorts show a variety of mobility experiences (see Table 4).[43] Although the share of fathers-children association declined in most of the cases, there are some countries, especially in the Sub-Saharan Africa, which experienced a higher share in the 1990s (out of the 7 countries with a higher share, 6 are in Sub-Saharan Africa). In South Asia, all countries experienced a substantial decline in the share, with the exception of Nepal where the decline is small in magnitude. The evidence suggests that the evolution of fathers-children share does not depend systematically on the level or evolution of sibling correlation in a country. For example, the share of intergenerational association between fathers and children declined in both Pakistan and Bangladesh even though their trajectories for sibling correlation were opposite (an increasing sibling correlation estimate in Pakistan, and a declining one in Bangladesh).

7 Cross-country Ranking and Mobility Trends Across Cohorts: Sibling Correlation vs. IGC and IGRC

In this section, we focus on two questions. First, do sibling correlation estimates imply a substantially different cross-country ranking of educational opportunities when compared to the ranking based on the estimates of parents-children schooling association such as IGC and IGRC? Second, are the conclusions regarding changes in educational opportunities across cohorts (from the 1970s

[43] Because of space constraint, Table 4 does not report the standard errors and the number of observations which are reported in the online appendix Tables A5 (1970s birth cohort), A6 (1980s birth cohort), and A7 (1990s birth cohort).

to the 1980s to the 1990s birth cohort) differ substantially depending on whether we rely on sibling correlation or IGRC and IGC? We analyze these questions in two ways: (i) compare our sibling correlation estimates with the IGRC and IGC estimates from the same DHS dataset; (ii) compare the estimates with the IGRC and IGC estimates from the existing studies.

IGRC and IGC estimates are available from recently published studies such as Neidhofer et al. (2018), Van Der Weide et al. (2023), Razzu and Wambile (2022), Azomahou and Yitbarek (2021), and Dendir (2023).[44] However, an important caveat here is that different studies use different data sources, and the age range of children selected also often differs. Thus, part of the differences in a comparison between these estimates and our sibling correlation estimates might be due to differences in data and age ranges.[45]

The caveats about comparability with the existing studies suggest that perhaps the best way to understand whether sibling correlation estimates yield substantially different cross-country ranking and cross-cohorts trends is to compare them with the IGC and IGRC estimates from the same data set and same age restrictions to define the estimation samples. We thus estimate IGC and IGRC from our DHS data with the same age restrictions (16-28 years children in the survey year). As noted earlier, IGC and sibling correlation are both robust to coresidency bias, and are conceptually similar as they normalize for the differences in cross-sectional educational inequality across countries and birth cohorts. This suggests that the comparison between sibling correlation and IGC is the most appropriate. But we also report evidence on IGRC vs. sibling correlation as IGRC remains the most widely-used measure of relative educational mobility.

7.1 Comparisons Based on DHS Data

The cross-country ranking of IGRC for the 1990s cohort is plotted against that of sibling correlation in the upper left hand corner and that of IGC in the upper right hand corner in Figure 5. At the country level, there is significant disagreement between IGRC and sibling correlations, for example, Burkina Faso ranks low in IGRC but relatively higher in sibling correlation ranking. The pattern for Egypt is the opposite. Indeed, most estimates are scattered away from the 45 degree line. The correlations between IGRC and sibling correlation ranking are 0.61 for the 1970s, 0.47 for the

[44] We do not include the estimates from the widely-cited cross-country study by Hertz et al. (2008) as there is only one overlapping birth cohort: the 1970s.

[45] A comparison with the existing studies may be useful for at least two reasons. First, many policy analysts rely on the the existing IGRC and IGC estimates for cross-country comparison. However, if the country ranking varies substantially depending on the measures (sibling correlation versus IGRC and IGC) and data sources, then policy analysts, policymakers, and donors need to take this into account. Second, estimates of IGRC and IGC from the World Bank's Global Database on Mobility (GDM) analyzed by Narayan et al. (2018) are increasingly used by researchers as dependent variable in cross-country analysis of the determinants of intergenerational mobility; see, for example, Duong (2024). The estimates reported by Van Der Weide et al. (2023) are based on the GDM data base and the earlier analysis of Narayan et al. (2018). The determinants of cross-country heterogeneity in sibling correlation might be substantially different when the cross-country rankings differ significantly.

1980s and 0.60 for the 1990s cohorts. The correlations are higher for IGC: 0.72 for the 1970s, 0.76 for the 1980s and 0.72 for the 1990s cohorts. The six graphs in Figure 5 suggest that cross-country rankings implied by sibling correlation are considerably different. When we focus on the full sample including the 1960s to the 1990s birth cohorts, the rank correlations are higher: 0.68 between IGRC and sibling correlation, and 0.78 between IGC and sibling correlation. The higher rank correlation for IGC reflects the fact that it is conceptually similar to sibling correlation: both are normalized measures, expressed as shares of the variance in children's schooling.

A related question is whether the changes in sibling correlations from the 1970s to the 1980s cohorts, and from the 1980s to the 1990s cohorts, suggest different trends compared to the changes in IGRC and IGC estimates. Figure 6 plot these changes. The left panel (column) shows the changes in sibling correlation against that in IGRC for the 1980s to the 1990s cohorts (the upper row), and for the 1970s to the 1980s cohorts (the lower row). The right panel shows the corresponding changes relative to the IGC estimates.

The first interesting observation is that the mass of the scatter plot has shifted upward in the younger cohorts, suggesting that the changes in sibling correlation from the 1980s to the 1990s cohorts are much larger, and this holds for both IGRC and IGC estimates. This implies that the IGRC and IGC estimates are likely to underestimate the extent of changes across cohorts in the overall educational opportunities. The north-west and south-east quadrants in these figures are especially informative. When the observations located on the horizontal and vertical axes away from the origin are included (excluded) they show the countries where sibling correlation estimates depict a substantially different (opposite) trend. The evidence suggests that the cross-cohort changes implied by sibling correlation estimates are different for about 20-30% cases. For example, for the IGRC estimates (top-left graph in Figure 6), in 22% cases, the trend implied by the sibling correlation estimates is substantially different.

7.2 Comparisons with the Existing Studies

Table A12 in online appendix reports the cross-country rankings for the 1970s and 1980s cohorts for the subset of countries in our sample which overlaps with the IGRC and IGC estimates reported by Van Der Weide et al. (2023). There are 32 overlapping countries for the 1970s cohort, and 51 overlapping countries for the 1980s cohort. The comparative rankings of countries by sibling correlation vs. IGRC are summarized in the online appendix: please see Figure A5(a) for the 1980s cohort and Figure A5(b) for the 1970s cohort. The corresponding figures for IGC estimates are A5(c) and A5(d) in the online appendix. The rank correlation between sibling correlation and IGRC estimates is 0.33 for the 1980s and 0.62 for the 1970s cohort, and between sibling correlation and IGC is 0.31 for the 1980s and 0.60 for the 1970s.

The left panel in Figure A6(a) in the online appendix summarizes the changes in sibling correlation vs. the changes in IGRC from the 1970s birth cohort to the 1980s birth cohorts for 31 overlapping countries in both cohorts and both studies (i.e., our study and that of Van Der Weide et al. (2023)). The corresponding changes in IGC vs. sibling correlation are in right panel of Figure A6(b) (appendix). Figure A6(a) suggests that the trend in sibling correlation is opposite to that in IGRC in about one third of the cases. The probability of such conflict is higher for the IGC estimates (see Figure A6(b)). Similar conflicts also arise when we compare our sibling correlation estimates with the estimates of IGRC in recent cross-country studies on African countries such as Dendir (2023) and Razzu and Wambile (2022), and on Latin American countries such as Neidhofer et al. (2018) (see Figure A7 and Table A13 in the appendix).

7.3 Share of Parents-Children Association Based on Existing Studies

Next we estimate the share of sibling correlation that can be attributed to parents-children association estimates available in the literature. For this exercise, we do not impose the stationarity assumption, and use the IGC estimates.[46] Based on equation (7) above we calculate the share as the proportion of IGC squared in the sibling correlation estimate (Bjorklund et al. (2010) method). Using the IGC estimates of Van Der Weide et al. (2023), the average share estimates are 33% for the 1970s cohort (32 countries) and 38% for the 1980s cohort (51 countries). For details, please see Table A14 in online appendix. These estimates are comparable to our estimate of 33% from the same method discussed in section (6.1) above. If we use the IGC estimates reported by Dendir (2023) for 22 Sub-Saharan African countries, and by Azomahou and Yitbarek (2021) for 9 Sub-Saharan African countries, we get a somewhat larger estimate of the share of fathers-children association in Africa, but the conclusion that the standard model of parents-children association used in these studies can explain only a limited part of sibling correlation remains valid.[47]

8 Conclusions

Using sibling correlation as an omnibus measure of children's educational opportunities, we provide evidence on intergenerational educational mobility in 53 developing countries and across three decade-wise birth cohorts (the 1970s, the 1980s, and the 1990s). To ensure cross-country comparability, we use 277 waves of Demographic and Health Surveys which provide high quality standardized data based on the same survey instruments across countries. To our knowledge,

[46] The IGRC estimates can be used only under the assumption of stationary distributions across generations which is rejected in our data.

[47] The details are available from the authors upon request.

this is the first paper to provide estimates of sibling correlation in schooling for a large number of developing countries for which no such estimates are available in economics or sociology literature.

The estimates suggest that sibling correlation in schooling in developing countries is much higher (average 0.60) than that in developed countries (average 0.41) implying a substantial gap in educational opportunities. Cross-country ranking based on sibling correlation is substantially different from that implied by the parents-children association estimates such as the IGRC and IGC reported in recent studies. Based on the DHS data, rank correlations between the IGRCs and sibling correlations are 0.61 for 1970s, 0.47 for 1980s and 0.60 for 1990s cohorts. The IGC and IGRC estimates available in the literature suggest even more striking differences in rankings compared to our sibling correlation estimates. A comparison of the sibling correlation estimates across the 1970s, the 1980s, and the 1990s birth cohorts suggests a different trend in relative mobility in many countries when compared to the trends implied by the IGRC and IGC estimates.

We take advantage of the recent approach of Bingley and Cappellari (2019) to estimate the share of sibling correlation that can be attributed to parents-children association in schooling. We find that relaxing the homogeneity and independence assumptions implicit in the standard model of parents-children association makes the estimated share much larger. The average share of intergenerational association between fathers and children for 53 countries increases from 33 percent (Bjorklund et al. (2010) method) to 73 percent (Bingley and Cappellari (2019) method). In our sample of countries, at least 60 percent of sibling correlation can be attributed to the fathers-children association, while there are some countries where the share is more than 80 percent (most in Sub-Saharan Africa). This is striking evidence against the widely-shared conclusion in the current literature on sibling correlation that the main mechanisms determining children's educational opportunities are not correlated with parent's education (see, for example, Solon (1999) and Bjorklund and Salvanes (2011)).

Evidence on the evolution of the fathers-children share over the 1970s to the 1990s birth cohorts, however, suggests a declining importance of fathers' influences in many countries. In some cases, the trend in the fathers-children association share is opposite (declining) to the trend in sibling correlation (increasing). Such conflicting trends suggest that, to improve the educational opportunities of children in these countries, the focus of the policy should be on the subset of socioeconomic factors which are uncorrelated with father's schooling. It is important to take into account the evidence from sibling correlation and parents-children association together for making informed policy choices.

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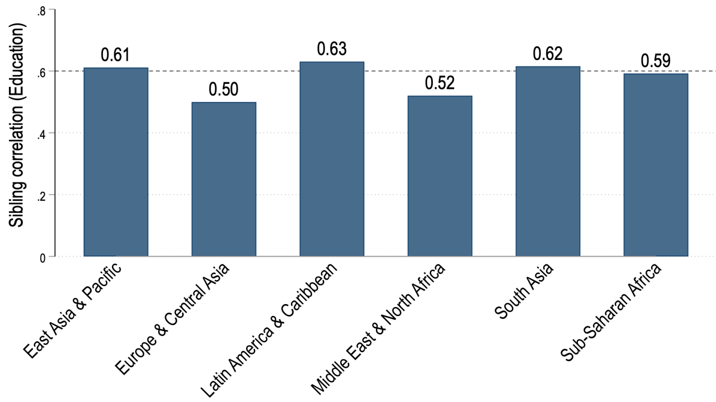
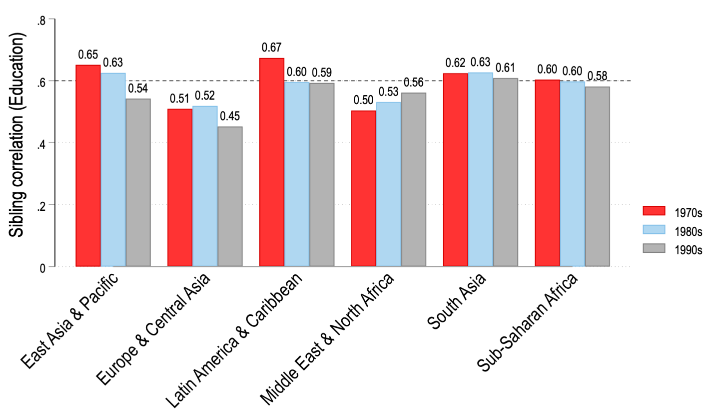
Figure 1: Average Sibling Correlation Estimates by Regions (Full Sample: 1960s-1990s Birth Cohorts of Children)



Notes. (1) This figure presents the average sibling correlation estimates for six regions of the world using the full sample including the 1960s to the 1990s birth cohorts. (2) Table 1 below lists the countries included in each region and reports the country-specific estimates. The country-specific estimates are weighted by the number of observations. (3) The data come from 277 waves of the Demographic and Health Surveys (DHS) for 53 developing countries. From each wave of DHS, children of age 16-28 years are included. Estimates for 20-28 years and 18-25 years children in each wave are in the online appendix. (4) The dashed line in the figure represents the overall average sibling correlation estimate for 53 countries in our sample, which is 0.60. For comparison, the average sibling correlation in developed countries, as reported in the current literature, is 0.41. (5) A higher estimate implies a lower relative educational mobility.

Figure 2: Average Sibling Correlation Estimates by Regions and Birth Cohorts



Notes. (1) This figure presents the average sibling correlation estimates for six regions of the world disaggregated by different decades of birth cohorts (the 1970s, 1980s, and 1990s). (2) Table 2 reports the list of the countries included in each region along with the country specific estimates. The country-specific estimates are weighted by the number of observations. (3) The data come from 277 waves of the Demographic and Health Surveys for 53 developing countries. From each wave of DHS, children of age 16-28 years are included. (4) The dashed line in the figure represents the overall average sibling correlation estimate for 53 countries in our sample, which is 0.60. For comparison purposes, the average sibling correlation in developed countries, as reported in the current literature, is 0.41. (5) A higher estimate implies a lower relative educational mobility.

Figure 3: Estimates of the Fathers-Children Share in Sibling Correlation by Regions

Figure 3A (Bingley and Cappellari 2019 Method)

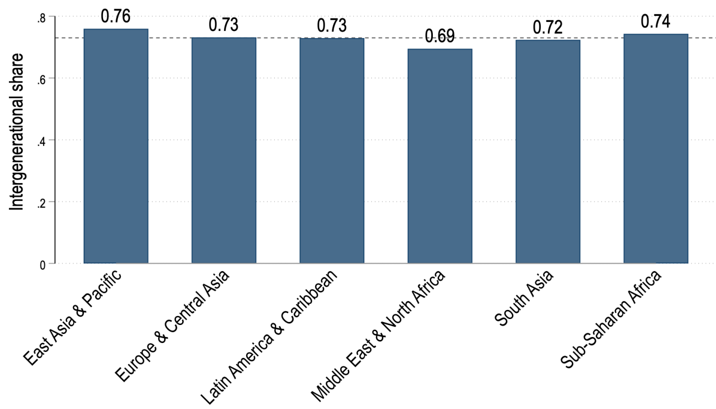
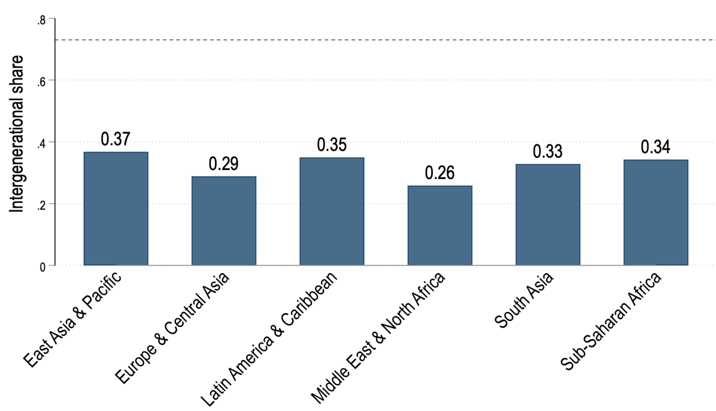
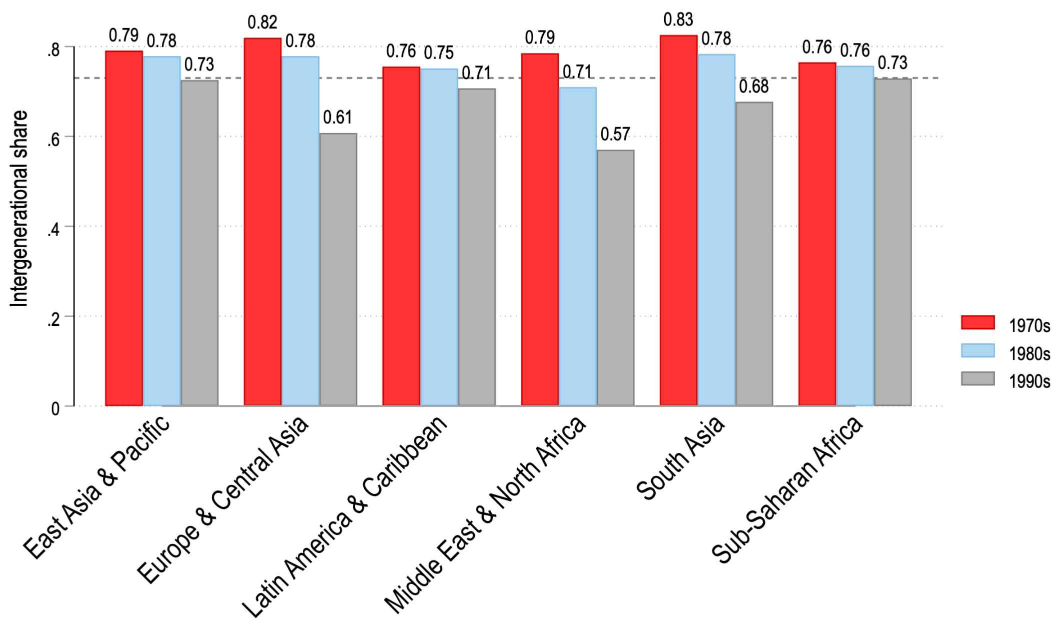


Figure 3B (Bjorklund et al. 2010 Method)



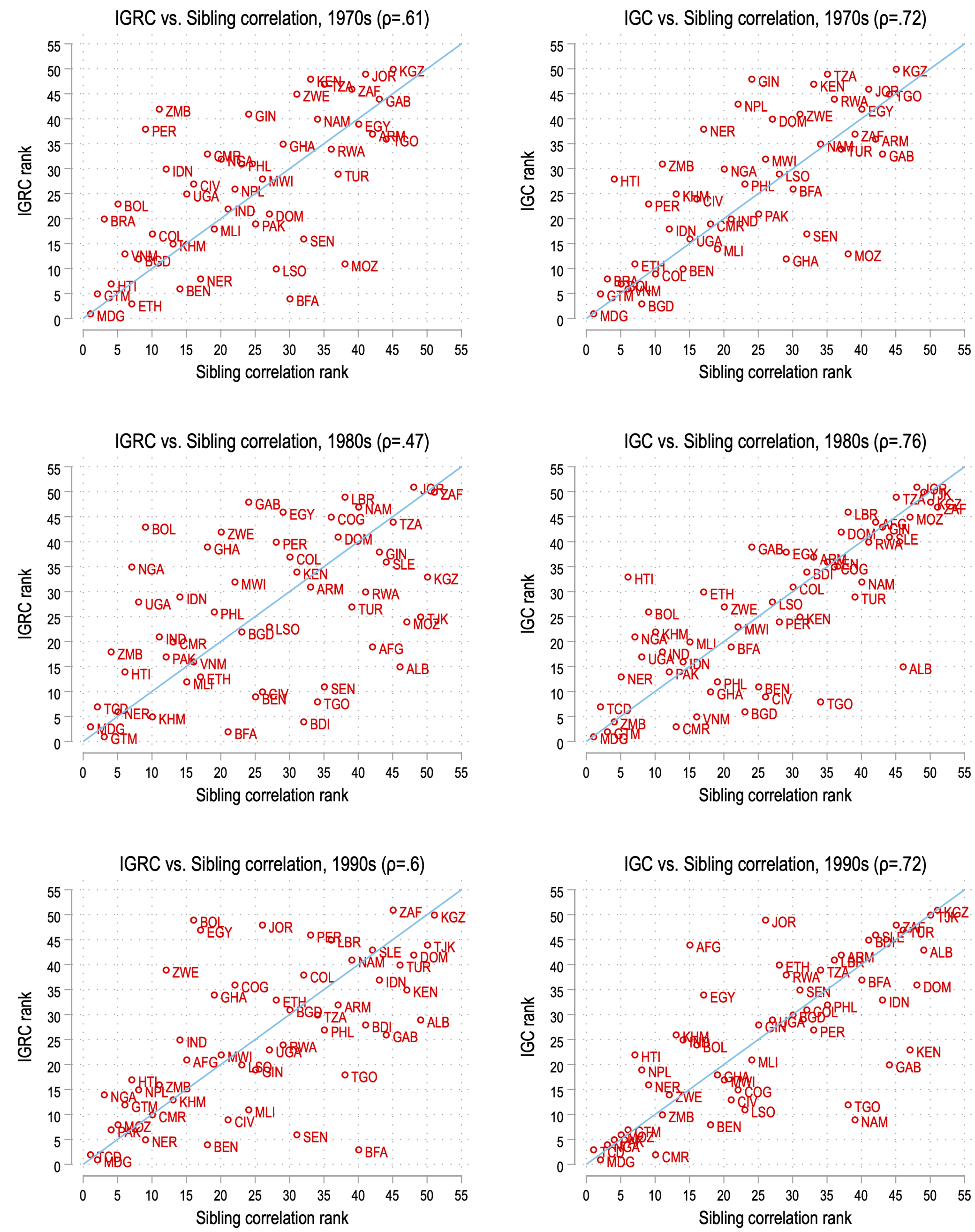
Notes. (1) This figure presents the estimated average fathers-children share in sibling correlation for six regions of the world using the full sample including the 1960s to the 1990s birth cohorts of children. Fathers-children share refers to the share of fathers-children association in schooling (normalized by generation specific standard deviation in schooling) in sibling correlation. (2) The data come from 277 waves of Demographic and Health Surveys for 53 developing countries. From each wave of DHS, children of age 16-28 years are included. (3) Countries included in each region are listed in Table 3 along with the country-specific estimates. The country-specific estimates are weighted by the number of observations. (4) Panel A uses the Bingley and Cappellari (2019) method, while Panel B uses the Bjorklund et al. (2010) method. (5) The dashed line in Panel A represents the overall average estimated fathers-children share in sibling correlation for 53 countries in our sample, which is 0.73.

Figure 4: Estimates of the Fathers-Children Share in Sibling Correlation by Regions and Cohorts (Bingley and Cappellari (2019) Method)



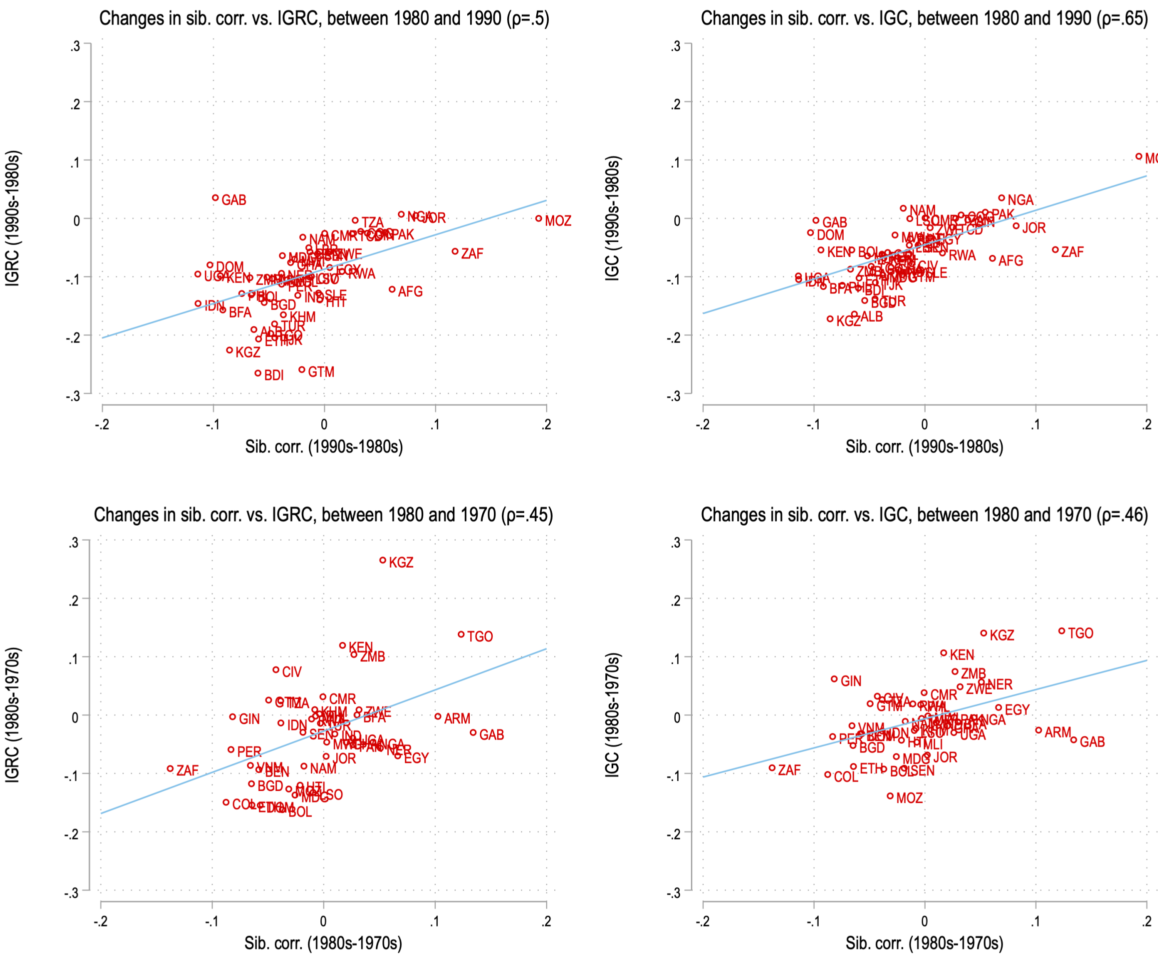
Notes. (1) This figure presents the average estimated fathers-children share in sibling correlation using the Bingley and Cappellari (2019) method for six regions of the world disaggregated by different decades of birth cohorts (the 1970s, 1980s, and 1990s). (2) The data come from Demographic and Health Surveys for 53 developing countries. (3) The list of countries in each region and the country-specific estimates are reported in Table 4. The country-specific estimates are weighted by the number of observations. (4) The dashed line in Panel A represents the overall average estimated fathers-children share in sibling correlation for 53 countries in our sample, which is 0.73.

Figure 5: Cross-Country Ranking based on Different Measures of Relative Intergenerational Mobility



Notes. (1) This figure presents the cross-country rankings for the 1970s, 1980s and 1990s cohorts. (2) A higher rank implies lower mobility. (3) The vertical axes in the left panel represent the IGRC rank for different birth cohorts. The vertical axes in the right panel represent the IGC for different birth cohorts. For all the sub-figures, the horizontal axis represents the sibling correlation rank for the relevant birth cohort (4) The blue line represents the 45-degree line.

Figure 6: Comparison of Mobility Trends based on Different Measures of Relative Intergenerational Mobility



Notes. (1) The left panel (column) reports the changes in sibling correlation versus the changes in IGRC, comparing the 1990s to 1980s (upper row) and 1980s to 1970s (lower row) birth cohorts. (2) The right panel (column) reports the corresponding changes in IGC versus sibling correlation. (3) A positive change implies a worsening of relative educational mobility. (4) The blue-colored line represents the linear fit of the scatters. (5) The North-West and South-West quadrants represent cases where the trend in sibling correlation is opposite to that in IGRC.

Table 1: Country-Specific Sibling Correlation Estimates (Full Sample: 1960s-1990s Birth Cohorts)

Country	Sib. Corr.	SE	N	Country	Sib. Corr.	SE	N
East Asia & Pacific				**Sub-Saharan Africa**			
Cambodia	0.636	0.007	13,534	Benin	0.600	0.010	5,480
Indonesia	0.621	0.004	34,321	Burkina Faso	0.568	0.011	5,115
Philippines	0.570	0.006	21,182	Burundi	0.541	0.014	3,971
Vietnam	0.664	0.011	3,692	Cameroon	0.629	0.012	3,644
				Chad	0.736	0.012	2,175
Europe & Central Asia				Congo	0.531	0.019	1,781
Albania	0.481	0.021	2,485	Cote d'Ivoire	0.580	0.015	2,555
Armenia	0.533	0.017	3,423	Ethiopia	0.672	0.007	8,141
Kyrgyz Republic	0.381	0.029	1,524	Gabon	0.515	0.019	2,097
Tajikistan	0.441	0.018	3,521	Ghana	0.590	0.011	4,747
Turkey	0.531	0.009	10,058	Guinea	0.559	0.016	2,700
				Kenya	0.516	0.009	11,960
Latin America & Caribbean				Lesotho	0.582	0.010	5,332
Bolivia	0.678	0.008	6,971	Liberia	0.533	0.019	1,779
Brazil	0.698	0.012	2,959	Madagascar	0.760	0.007	6,528
Colombia	0.606	0.006	17,607	Malawi	0.598	0.010	6,164
Dominican Republic	0.566	0.009	8,186	Mali	0.604	0.013	3,910
Guatemala	0.712	0.007	6,553	Mozambique	0.570	0.012	5,036
Haiti	0.682	0.009	5,993	Namibia	0.524	0.019	2,584
Peru	0.616	0.005	29,090	Niger	0.665	0.014	2,239
				Nigeria	0.695	0.006	13,719
Middle East & North Africa				Rwanda	0.537	0.010	8,664
Egypt	0.541	0.005	30,036	Senegal	0.553	0.007	12,718
Jordan	0.498	0.007	27,999	Sierra Leone	0.513	0.016	2,819
				South Africa	0.490	0.020	2,407
South Asia				Tanzania	0.519	0.009	9,761
Afghanistan	0.565	0.009	7,823	Togo	0.522	0.019	1,629
Bangladesh	0.607	0.005	17,853	Uganda	0.621	0.011	4,197
India	0.614	0.002	268,064	Zambia	0.643	0.009	6,103
Nepal	0.642	0.008	6,987	Zimbabwe	0.589	0.015	3,412
Pakistan	0.631	0.004	40,964				

Notes. (1) This table presents the sibling correlation estimates for each of the 53 developing countries in the Demographic and Health Surveys (DHS) using the full sample. (2) A higher estimate implies lower mobility.

Table 2: Country-Specific Sibling Correlation Estimates (By Decade-wise Birth Cohorts)

Country	1970s	1980s	1990s	Country	1970s	1980s	1990s
East Asia & Pacific				**Sub-Saharan Africa**			
Cambodia	0.655	0.647	0.610	Benin	0.653	0.594	0.581
Indonesia	0.659	0.620	0.506	Burkina Faso	0.578	0.607	0.515
Philippines	0.613	0.609	0.534	Burundi	n.a.	0.573	0.512
Vietnam	0.682	0.616	n.a.	Cameroon	0.630	0.629	0.629
				Chad	n.a.	0.727	0.752
Europe & Central Asia				Congo	n.a.	0.540	0.573
Albania	n.a.	0.497	0.433	Cote d'Ivoire	0.635	0.592	0.579
Armenia	0.468	0.570	0.523	Ethiopia	0.678	0.613	0.553
Kyrgyz Republic	0.384	0.437	0.351	Gabon	0.467	0.601	0.502
Tajikistan	n.a.	0.467	0.422	Ghana	0.591	0.611	0.580
Turkey	0.540	0.537	0.492	Guinea	0.606	0.524	0.563
				Kenya	0.562	0.578	0.484
Latin America & Caribbean				Lesotho	0.595	0.585	0.571
Bolivia	0.692	0.655	0.588	Liberia	n.a.	0.538	0.523
Brazil	0.709	n.a.	n.a.	Madagascar	0.814	0.788	0.750
Colombia	0.668	0.580	0.546	Malawi	0.605	0.607	0.580
Dominican Republic	0.595	0.538	0.435	Mali	0.627	0.619	0.567
Guatemala	0.747	0.697	0.677	Mozambique	0.522	0.490	0.683
Haiti	0.699	0.677	0.673	Namibia	0.554	0.536	0.516
Peru	0.668	0.585	0.546	Niger	0.634	0.685	0.646
				Nigeria	0.627	0.671	0.739
Middle East & North Africa				Rwanda	0.546	0.535	0.550
Egypt	0.517	0.583	0.587	Senegal	0.572	0.553	0.546
Jordan	0.471	0.473	0.555	Sierra Leone	n.a.	0.516	0.510
				South Africa	0.521	0.383	0.501
South Asia				Tanzania	0.549	0.510	0.538
Afghanistan	n.a.	0.530	0.590	Togo	0.447	0.570	0.521
Bangladesh	0.669	0.604	0.550	Uganda	0.642	0.668	0.554
India	0.623	0.632	0.608	Zambia	0.660	0.687	0.620
Nepal	0.614	n.a.	0.648	Zimbabwe	0.577	0.608	0.612
Pakistan	0.605	0.631	0.685				

Notes. (1) This table presents the sibling correlation estimates for each of the 53 developing countries in the DHS disaggregated by different decades of birth cohorts (the 1970s, 1980s, and 1990s). (2) A higher estimate implies lower mobility.

Table 3: Country-Specific Fathers-Children Share in Sibling Correlation (Full Sample: 1960s-1990s Birth Cohorts)

Country	**Int. share**	**SE**	**N**	**Country**	**Int. share**	**SE**	**N**
East Asia & Pacific				**Sub-Saharan Africa**			
Cambodia	0.682	0.010	13,534	Benin	0.823	0.018	5,480
Indonesia	0.776	0.007	34,321	Burkina Faso	0.707	0.019	5,115
Philippines	0.771	0.010	21,182	Burundi	0.654	0.024	3,971
Vietnam	0.824	0.018	3,692	Cameroon	0.848	0.021	3,644
				Chad	0.717	0.020	2,175
Europe & Central Asia				Congo	0.857	0.039	1,781
Albania	0.747	0.040	2,485	Cote d'Ivoire	0.785	0.026	2,555
Armenia	0.785	0.031	3,423	Ethiopia	0.716	0.011	8,141
Kyrgyz Republic	0.662	0.064	1,524	Gabon	0.796	0.038	2,097
Tajikistan	0.645	0.037	3,521	Ghana	0.759	0.019	4,747
Turkey	0.750	0.015	10,058	Guinea	0.706	0.027	2,700
				Kenya	0.772	0.017	11,960
Latin America & Caribbean				Lesotho	0.739	0.018	5,332
Bolivia	0.720	0.012	6,971	Liberia	0.690	0.035	1,779
Brazil	0.749	0.018	2,959	Madagascar	0.828	0.011	6,528
Colombia	0.728	0.009	17,607	Malawi	0.751	0.017	6,164
Dominican Republic	0.692	0.015	8,186	Mali	0.745	0.022	3,910
Guatemala	0.741	0.011	6,553	Mozambique	0.819	0.022	5,036
Haiti	0.639	0.013	5,993	Namibia	0.749	0.034	2,584
Peru	0.757	0.007	29,090	Niger	0.692	0.023	2,239
				Nigeria	0.707	0.009	13,719
Middle East & North Africa				Rwanda	0.717	0.019	8,664
Egypt	0.743	0.008	30,036	Senegal	0.747	0.014	12,718
Jordan	0.643	0.011	27,999	Sierra Leone	0.666	0.029	2,819
				South Africa	0.786	0.041	2,407
South Asia				Tanzania	0.667	0.017	9,761
Afghanistan	0.614	0.014	7,823	Togo	0.828	0.039	1,629
Bangladesh	0.781	0.008	17,853	Uganda	0.736	0.020	4,197
India	0.711	0.002	268,064	Zambia	0.743	0.015	6,103
Nepal	0.667	0.011	6,987	Zimbabwe	0.706	0.024	3,412
Pakistan	0.810	0.006	40,964				

Notes. (1) This table presents the estimated fathers-children share in sibling correlation using the Bingley and Cappellari (2019) method for each of the 53 developing countries using the full sample. (2) The method relaxes the homogeneity, independence, and normality assumptions is estimating the fathers-children association.

Table 4: Country-Specific Fathers-Children Share in Sibling Correlation (By Decade-wise Birth Cohorts)

Country	1970s	1980s	1990s	Country	1970s	1980s	1990s
East Asia & Pacific				**Sub-Saharan Africa**			
Cambodia	0.731	0.706	0.660	Benin	0.866	0.847	0.796
Indonesia	0.786	0.788	0.772	Burkina Faso	0.855	0.726	0.663
Philippines	0.815	0.836	0.728	Burundi	n.a.	0.727	0.632
Vietnam	0.829	0.867	n.a.	Cameroon	0.754	0.841	0.870
				Chad	n.a.	0.752	0.694
Europe & Central Asia				Congo	n.a.	0.865	0.761
Albania	n.a.	0.865	0.721	Cote d'Ivoire	0.760	0.863	0.769
Armenia	0.946	0.759	0.619	Ethiopia	0.777	0.726	0.682
Kyrgyz Republic	0.485	0.777	0.537	Gabon	0.902	0.698	0.799
Tajikistan	n.a.	0.707	0.588	Ghana	0.849	0.793	0.710
Turkey	0.825	0.792	0.563	Guinea	0.558	0.767	0.723
				Kenya	0.651	0.765	0.822
Latin America & Caribbean				Lesotho	0.721	0.736	0.775
Bolivia	0.761	0.708	0.683	Liberia	n.a.	0.678	0.699
Brazil	0.757	n.a.	n.a.	Madagascar	0.858	0.830	0.797
Colombia	0.777	0.754	0.706	Malawi	0.763	0.766	0.746
Dominican Republic	0.700	0.727	0.838	Mali	0.851	0.749	0.693
Guatemala	0.761	0.798	0.722	Mozambique	0.917	0.824	0.749
Haiti	0.702	0.649	0.626	Namibia	0.685	0.772	0.818
Peru	0.767	0.780	0.733	Niger	0.707	0.708	0.695
				Nigeria	0.714	0.702	0.696
Middle East & North Africa				Rwanda	0.727	0.766	0.666
Egypt	0.792	0.739	0.658	Senegal	0.833	0.779	0.725
Jordan	0.767	0.678	0.548	Sierra Leone	n.a.	0.761	0.609
				South Africa	0.877	0.836	0.592
South Asia				Tanzania	0.606	0.671	0.670
Afghanistan	n.a.	0.722	0.557	Togo	0.832	0.846	0.837
Bangladesh	0.854	0.873	0.709	Uganda	0.791	0.753	0.704
India	0.828	0.760	0.677	Zambia	0.731	0.773	0.729
Nepal	0.676	n.a.	0.667	Zimbabwe	0.671	0.695	0.731
Pakistan	0.819	0.814	0.760				

Notes. (1) This table presents the estimated fathers-children share in sibling correlation using the Bingley and Cappellari (2019) method for each of the 53 developing countries in the DHS disaggregated by different decades of birth cohorts (the 1970s, 1980s, and 1990s). (2) The method relaxes the homogeneity, independence, and normality assumptions is estimating the fathers-children association.

Online Appendix

Growing Up Together: Sibling Correlation, Parental Influence, and Intergenerational Educational Mobility in Developing Countries

Md. Nazmul Ahsan, Washington University in St. Louis
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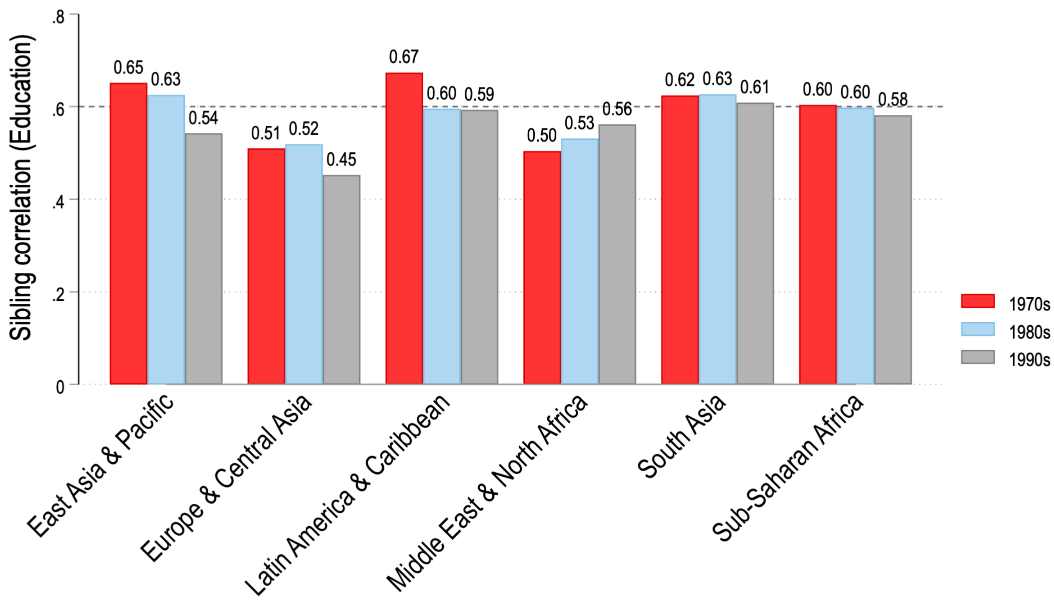
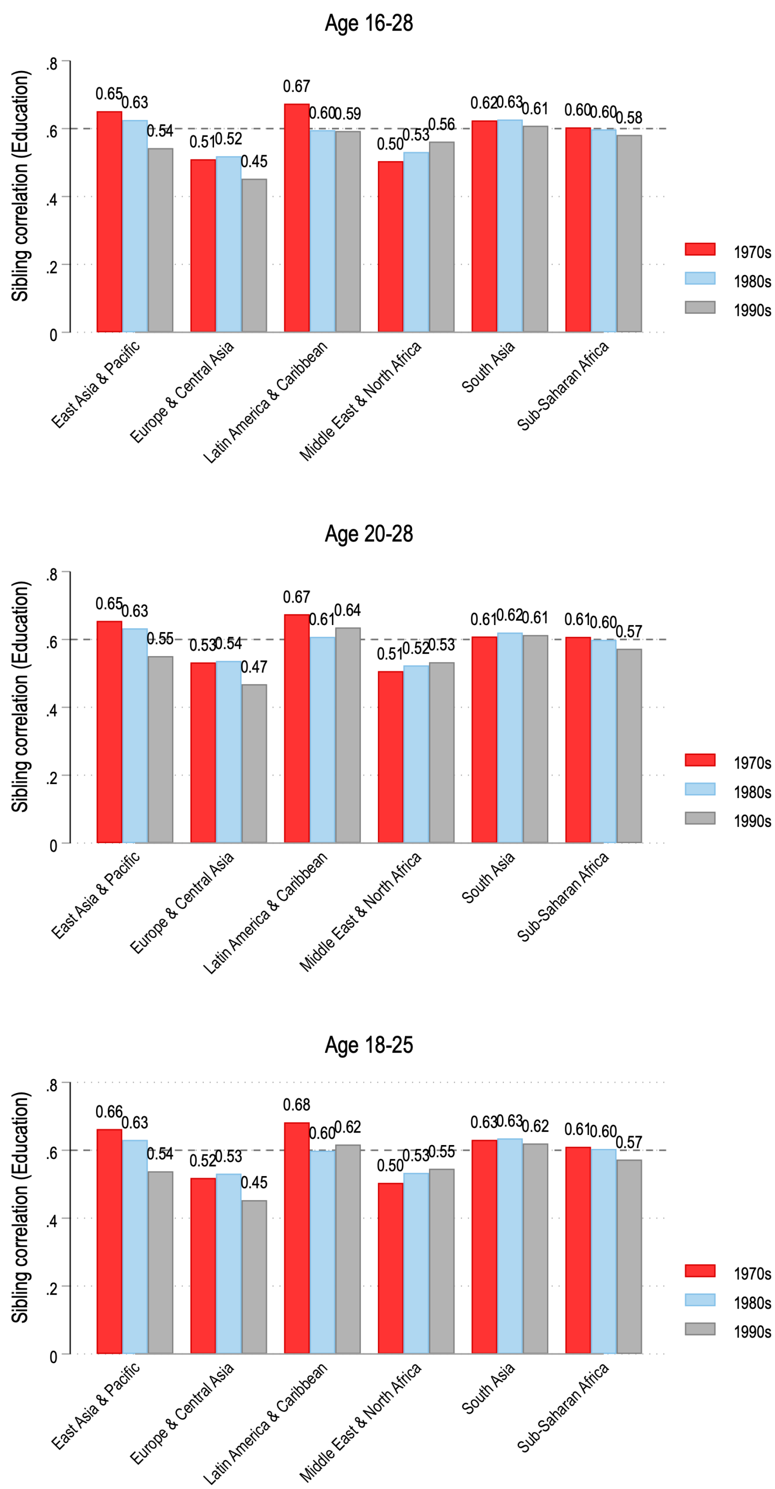
Figure A1: Average Sibling Correlation Estimates by Regions (Full Sample: 1960s-1990s Birth Cohorts of Children)



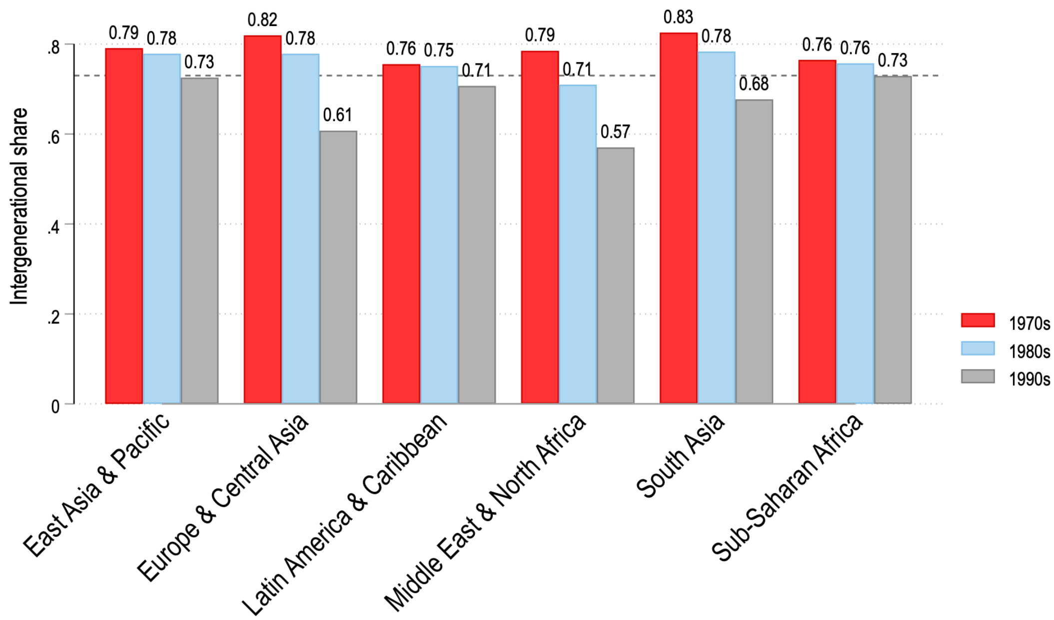
Notes. This figure presents the average sibling correlation estimates for six regions of the world using the full sample of each age group (16-28, 20-28 and 18-25). A higher estimate implies a lower relative educational mobility.

Figure A2: Average Sibling Correlation Estimates by Regions and Birth Cohorts for different age groups



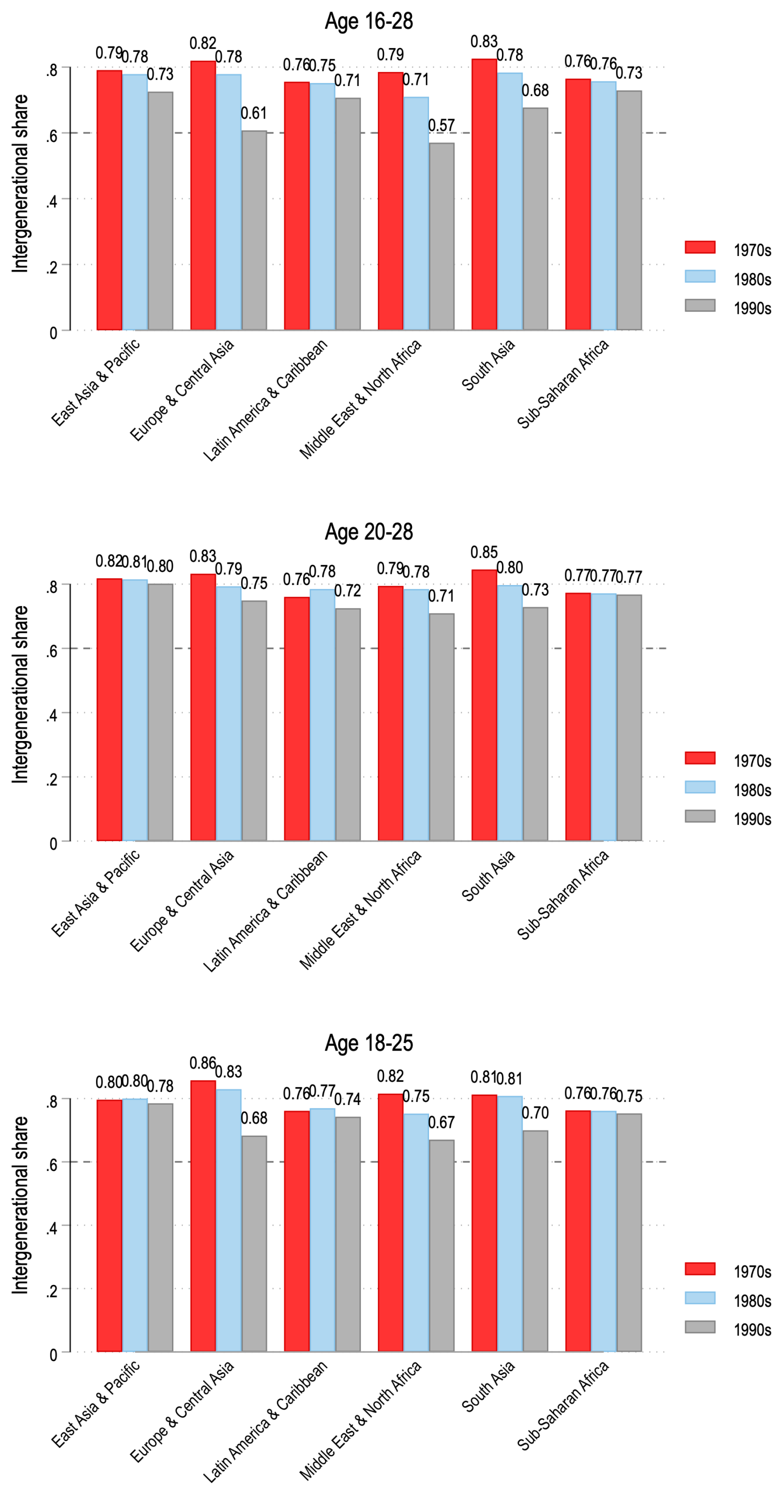
Notes. This figure presents the average sibling correlation estimates for six regions of the world disaggregated by different decades of birth cohorts (the 1970s, 1980s, and 1990s) for each age group indicated in column heading. A higher estimate implies a lower relative educational mobility.

Figure A3: Estimates of the Fathers-Children Share in Sibling Correlation by Regions and Cohorts (Bingley and Cappellari (2019) Method)



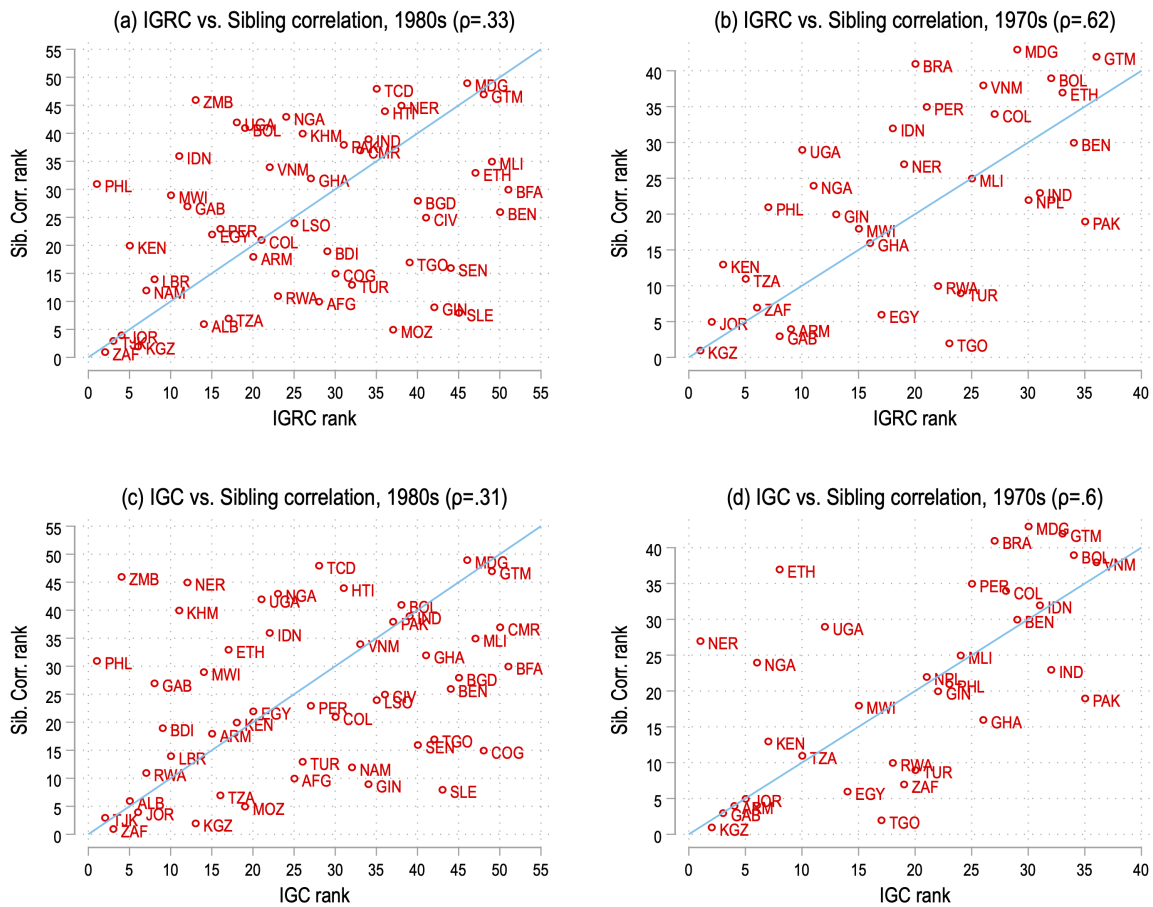
Notes. This figure presents the average estimated fathers-children share in sibling correlation for six regions of the world using the full sample of each age groups represented by different colors. Fathers-children share refers to fathers-children association in schooling (normalized by generation specific standard deviation in schooling).

Figure A4: Estimates of the Fathers-Children Share in Sibling Correlation by Regions and Cohorts (Bingley and Cappellari (2019) Method)



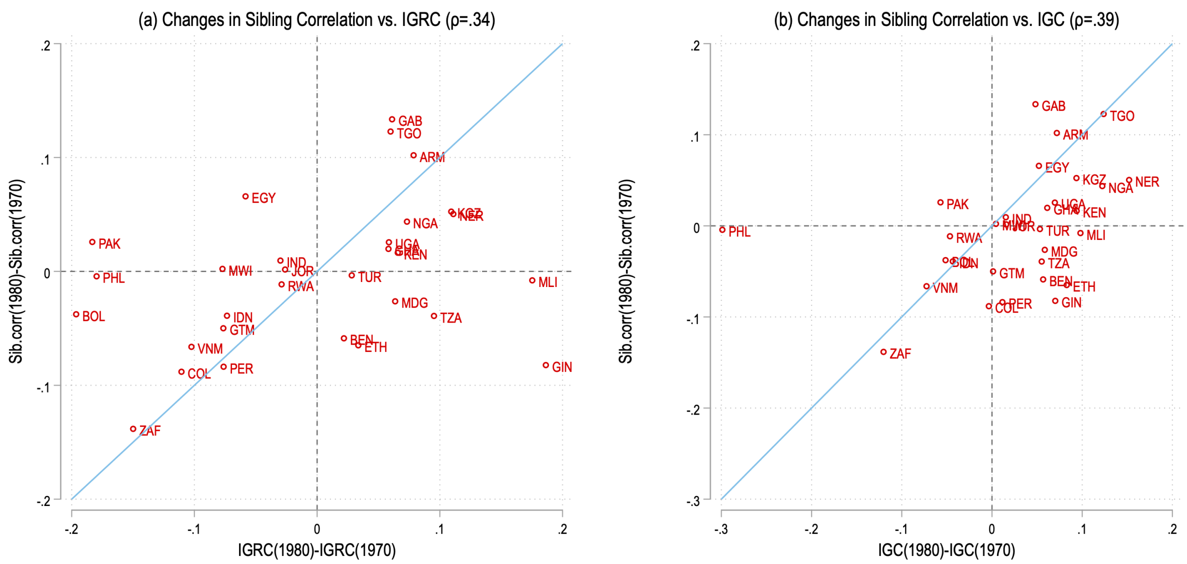
Notes. This figure presents the average estimated fathers-children share in sibling correlation for six regions of the world using the full sample. Fathers-children share refers to fathers-children association in schooling (normalized by generation specific standard deviation in schooling).

Figure A5: Cross-Country Ranking based on Different Measures of Relative Intergenerational Mobility



Notes. (1) This figure presents the cross-country rankings for the 1970s and 1980s cohorts, focusing on the subset of countries in our sample that overlaps with the Intergenerational Regression Coefficient (IGRC) and Intergenerational Correlation (IGC) estimates reported by Van Der Weide et al. (2023). (2) A higher rank implies lower mobility. (3) The vertical axes in Figures A.5A and A.5B represent the IGRC for the 1980 and 1970 birth cohorts, respectively. The vertical axes in Figures A.5C and A.5D represent the IGC for the 1980 and 1970 birth cohorts, respectively. For all the sub-figures, the horizontal axis represents the sibling correlation rank for the relevant birth cohort (4) The burgundy-colored line represents the 45-degree line.

Figure A6: Comparison of Mobility Trends based on Different Measures of Relative Intergenerational Mobility



Notes. (1) Figure A.6A (left) reports the changes in sibling correlation versus the changes in IGRC, comparing the 1970s birth cohort to the 1980s birth cohorts. It includes 31 countries that appear in both cohorts and are covered in both our study and that of Van Der Weide et al. (2023). (2) Figure A.6B (right) reports the corresponding changes in IGC versus sibling correlation for the same set of countries. (3) A positive change implies a worsening of relative educational mobility. (4) The burgundy-colored line represents the 45-degree line. (5) The North-West and South-West quadrants represent cases where the trend in sibling correlation is opposite to that in IGRC.

Figure A7: Trends in Relative Educational Mobility in Sub-Saharan African Countries: A Comparison of the IGC Estimates of Dendir (2022) and Sibling Correlation Estimates

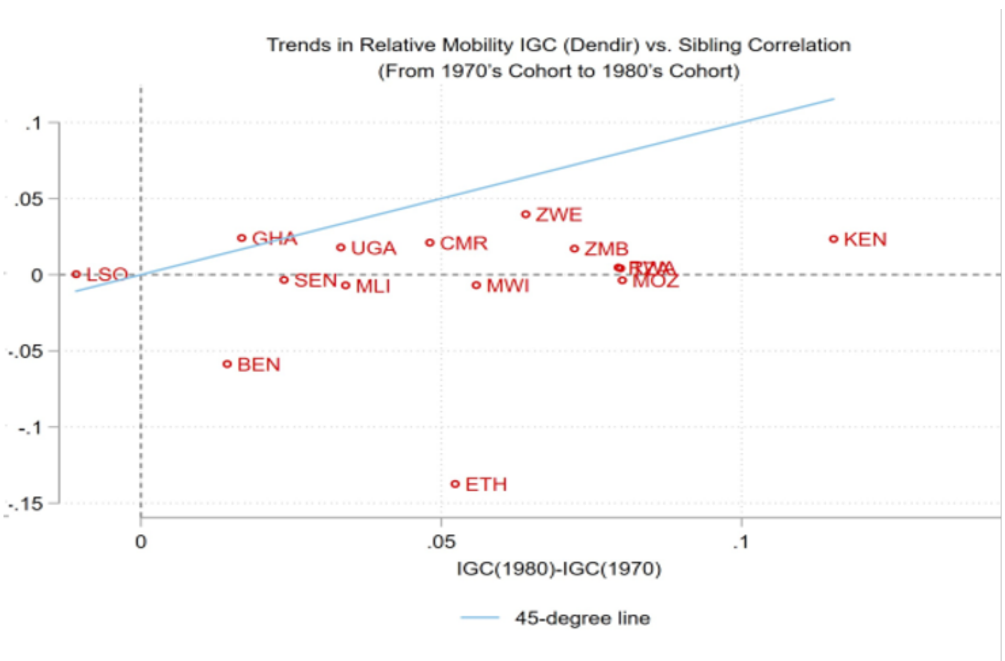


Table A0: Specific Waves Used from 53 Countries in the Demographic and Health Survey (DHS)

Country	DHS waves used	N households	Country	DHS waves used	N households
	East Asia and Pacific			**Sub-Saharan Africa**	
Cambodia	2000,2006,2011,2014,2022	78,777	Benin	1996,2001,2006,2012,2018	59,357
Indonesia	1991,1994,1997,2003,2007,2012,2017	260,455	Burkina Faso	1993,1999,2003,2010,2021	46,727
Philippines	1993,1998,2003,2008,2013,2017,2022	123,129	Burundi	2011,2013,2017	29,439
Vietnam	1997,2002,2005	20,386	Cameroon	1991,1998,2004,2011,2019	44,621
	Europe & Central Asia		Chad	1997,2004,2015	29,442
Albania	2009,2018	23,822	Congo	2005,2009,2012	24,607
Armenia	2000,2005,2010,2016	27,280	Cote d'Ivoire	1994,1999,2005,2012,2021	36,877
Kyrgyz Republic	1997,2012	11,712	Ethiopia	1992,1997,2003,2008,2011	69,808
Tajikistan	2012,2017	14,275	Gabon	2001,2012,2021	27,739
Turkey	1993,1998,2004,2008,2013,2019	60,889	Ghana	1994,1999,2003,2008,2014,2023	59,622
	Latin America & Caribbean		Guinea	1999,2005,2012,2018	26,393
Bolivia	1994,1998,2004,2008	59,994	Kenya	1993,1998,2003,2009,2014,2022	108,289
Brazil	1992,1996	19,347	Lesotho	2005,2010,2014,2024	37,195
Colombia	1990,1995,2000,2005,2010,2016	161,703	Liberia	2007,2013,2020	25,225
Dominican Republic	1991,1996,1999,2002,2007,2013	88,384	Madagascar	1992,1997,2004,2009,2021	59,902
Guatemala	1995,1999,2015	38,267	Malawi	1992,2000,2005,2010,2016	84,386
Haiti	1995,2000,2006,2012,2017	50,997	Mali	1996,2001,2006,2013,2018	53,660
Peru	1992,1996,2000,2008,2009,2010,2011,2012	223,759	Mozambique	1997,2004,2009,2011,2015,2023	63,032
	Middle East & North Africa		Namibia	1992,2000,2007,2013	29,542
Egypt	1993,1996,2000,2003,2005,2008,2014	122,488	Niger	1992,1998,2006,2012	29,580
Jordan	1997,2002,2007,2009,2012,2018,2023	96,768	Nigeria	1990,2003,2008,2010,2013,2015,2018	142,883
	South Asia		Rwanda	1992,2000,2005,2011,2015,2020	64,408
Afghanistan	2015	24,395	Senegal	1993,2005,2011,2013,2014,2015,2016,2017,2018,2019,2023	62,129
Bangladesh	1994,1997,2000,2004,2007,2011,2014,2018,2022	132,526	Sierra Leone	2008,2013,2019	33,312
India	1993,2000,2006,2016,2021	1,528,297	South Africa	1998,2016	23,330
Nepal	1996,2058,2063,2068,2073,2079	61,043	Tanzania	1992,1996,1999,2004,2005,2008,2010,2012,2016,2022	92,573
Pakistan	1991,2007,2013,2018	130,117	Togo	1998,2014	17,066
			Uganda	1995,2001,2006,2011,2016	52,926
			Zambia	1992,1997,2002,2007,2014,2019	56,536
			Zimbabwe	1994,1999,2006,2011,2015	41,928

Notes. This table presents the specific waves used from 53 countries in the Demographic and Health Survey (DHS). Total households refer to the total number of households existing in the original DHS data, which may differ from the actual number of observations used in the empirical analysis. For the latter, see Table A1.

Table A1: Summary Statistics

Country	**Avg. years schooling (child)**	**SD**	**Avg. years of schooling (father)**	**SD**	**N**
		East Asia & Pacific			
Cambodia	6.86	3.95	4.59	3.59	40,110
Indonesia	9.57	3.64	6.74	4.47	116,324
Philippines	10.25	3.55	8.19	4.37	64,605
Vietnam	8.42	3.55	7.33	3.82	11,374
		Europe & Central Asia			
Albania	11.92	3.87	10.73	4.08	8,602
Armenia	10.59	2.57	10.84	2.79	10,260
Kyrgyz Republic	11.04	2.29	10.80	2.75	4,897
Tajikistan	10.94	2.80	11.62	2.62	10,417
Turkey	8.88	3.66	5.67	3.94	32,782
		Latin America & Caribbean			
Bolivia	10.01	3.59	6.98	4.89	20,497
Brazil	6.34	3.97	3.39	4.13	8,249
Colombia	9.57	3.49	6.02	4.46	48,525
Dominican Republic	8.95	3.96	5.52	4.55	22,704
Guatemala	6.88	4.20	3.39	4.16	18,130
Haiti	6.88	3.75	2.90	3.73	14,480
Peru	9.93	3.18	7.46	4.52	88,518
		Middle East & North Africa			
Egypt	9.51	4.27	5.31	5.72	83,889
Jordan	11.52	2.91	9.06	4.58	82,920
		South Asia			
Afghanistan	6.21	4.91	3.26	4.75	26,451
Bangladesh	7.43	3.94	4.44	4.67	62,357
India	9.69	4.05	5.79	4.92	820,877
Nepal	7.33	3.73	3.49	4.08	23,584
Pakistan	6.66	4.72	4.62	5.10	131,855

Country	**Avg. years schooling**	**SD**	**Avg. father years of schooling**	**SD**	**N**
		Sub-Saharan Africa			
Benin	5.73	4.61	2.89	4.39	16,399
Burkina Faso	4.40	4.54	1.31	3.24	18,374
Burundi	6.24	3.74	2.68	3.62	10,199
Cameroon	7.99	3.75	6.02	4.78	11,350
Chad	4.03	4.44	2.45	4.29	6,824
Congo	7.60	3.25	8.31	4.79	5,365
Cote d'Ivoire	5.95	4.74	3.47	4.95	8,557
Ethiopia	5.38	4.44	2.21	3.92	22,435
Gabon	8.13	3.16	7.87	4.58	5,289
Ghana	8.19	3.88	5.70	5.63	12,957
Guinea	5.16	4.77	2.84	5.33	9,031
Kenya	8.72	3.35	6.69	4.71	28,825
Lesotho	7.65	3.48	4.05	4.08	12,131
Liberia	5.68	3.67	6.56	5.37	5,798
Madagascar	4.97	4.17	4.31	4.20	17,821
Malawi	6.83	3.37	5.75	4.08	17,345
Mali	3.89	4.34	2.01	4.19	13,910
Mozambique	6.12	3.88	4.66	3.88	12,853
Namibia	8.17	3.17	5.10	4.85	5,966
Niger	3.56	4.08	1.40	3.57	7,706
Nigeria	8.84	4.42	5.82	5.75	43,061
Rwanda	5.53	3.34	3.57	3.50	19,129
Senegal	5.03	4.58	1.84	3.86	35,033
Sierra Leone	7.00	4.25	3.61	5.35	8,971
South Africa	9.81	2.77	6.78	4.71	4,937
Tanzania	7.02	3.35	4.86	4.02	29,197
Togo	5.85	3.87	3.23	4.19	4,961
Uganda	6.85	3.71	6.06	4.38	11,210
Zambia	7.45	3.25	6.95	4.12	16,973
Zimbabwe	9.10	2.58	6.44	4.07	8,646

Notes. This table presents the summary statistics for children's schooling, father's schooling, and number of observations (obs.) in each of the 53 countries used in this paper.

Table A2: Country-Specific Sibling Correlation Estimates (1970 Birth Cohort)

Country	Sib. Corr.	SE	N	Country	Sib. Corr.	SE	N
East Asia & Pacific				**Sub-Saharan Africa**			
Cambodia	0.655	0.014	2,305	Benin	0.653	0.022	1,028
Indonesia	0.659	0.006	12,688	Burkina Faso	0.578	0.023	1,307
Philippines	0.613	0.013	4,500	Burundi	n.a.	n.a.	n.a.
Vietnam	0.682	0.013	2,286	Cameroon	0.630	0.037	381
				Chad	n.a.	n.a.	n.a.
Europe & Central Asia				Congo	n.a.	n.a.	n.a.
Albania	n.a.	n.a.	n.a.	Cote d'Ivoire	0.635	0.029	534
Armenia	0.468	0.032	1,099	Ethiopia	0.678	0.011	3,167
Kyrgyz Republic	0.384	0.057	479	Gabon	0.467	0.036	482
Tajikistan	n.a.	n.a.	n.a.	Ghana	0.591	0.028	986
Turkey	0.540	0.013	3,464	Guinea	0.606	0.030	656
				Kenya	0.562	0.020	1,946
Latin America & Caribbean				Lesotho	0.595	0.025	767
Bolivia	0.692	0.011	3,293	Liberia	n.a.	n.a.	n.a.
Brazil	0.709	0.014	1,844	Madagascar	0.814	0.012	1,572
Colombia	0.668	0.010	4,139	Malawi	0.605	0.019	1,264
Dominican Republic	0.595	0.014	3,097	Mali	0.627	0.028	815
Guatemala	0.747	0.011	2,123	Mozambique	0.522	0.027	1,363
Haiti	0.699	0.015	1,299	Namibia	0.554	0.031	866
Peru	0.668	0.007	9,326	Niger	0.634	0.028	762
				Nigeria	0.627	0.028	912
Middle East & North Africa				Rwanda	0.546	0.021	1,521
Egypt	0.517	0.008	11,076	Senegal	0.572	0.027	891
Jordan	0.471	0.015	4,379	Sierra Leone	n.a.	n.a.	n.a.
				South Africa	0.521	0.025	1,325
South Asia				Tanzania	0.549	0.021	2,060
Afghanistan	n.a.	n.a.	n.a.	Togo	0.447	0.029	712
Bangladesh	0.669	0.009	4,206	Uganda	0.642	0.024	838
India	0.623	0.005	20,378	Zambia	0.660	0.017	1,644
Nepal	0.614	0.024	852	Zimbabwe	0.577	0.023	1,231
Pakistan	0.605	0.008	8,072				

Notes. (1) This table presents the sibling correlation estimates for each of the 53 developing countries in the Demographic and Health Surveys (DHS) using the 1970s birth cohort sample. (2) A higher estimate implies lower mobility.

Table A3: Country-Specific Sibling Correlation Estimates (1980 Birth Cohort)

Country	Sib. Corr.	SE	N	Country	Sib. Corr.	SE	N
East Asia & Pacific				**Sub-Saharan Africa**			
Cambodia	0.647	0.008	6,952	Benin	0.594	0.015	2,500
Indonesia	0.620	0.007	10,529	Burkina Faso	0.607	0.019	1,671
Philippines	0.609	0.011	5,107	Burundi	0.573	0.020	1,492
Vietnam	0.616	0.022	1,232	Cameroon	0.629	0.017	1,755
				Chad	0.727	0.022	844
Europe & Central Asia				Congo	0.540	0.023	1,262
Albania	0.497	0.032	1,183	Cote d'Ivoire	0.592	0.028	622
Armenia	0.570	0.022	1,806	Ethiopia	0.613	0.012	3,074
Kyrgyz Republic	0.437	0.037	619	Gabon	0.601	0.034	494
Tajikistan	0.467	0.024	1,612	Ghana	0.611	0.020	1,608
Turkey	0.537	0.014	3,645	Guinea	0.524	0.025	1,049
				Kenya	0.578	0.017	2,617
Latin America & Caribbean				Lesotho	0.585	0.012	3,006
Bolivia	0.655	0.015	3,141	Liberia	0.538	0.028	780
Brazil	n.a.	n.a.	n.a.	Madagascar	0.788	0.010	2,064
Colombia	0.580	0.009	9,092	Malawi	0.607	0.014	2,594
Dominican Republic	0.538	0.014	4,279	Mali	0.619	0.018	1,650
Guatemala	0.697	0.015	1,376	Mozambique	0.490	0.022	1,619
Haiti	0.677	0.013	2,587	Namibia	0.536	0.030	1,055
Peru	0.585	0.007	14,182	Niger	0.685	0.017	1,082
				Nigeria	0.671	0.010	6,102
Middle East & North Africa				Rwanda	0.535	0.016	3,356
Egypt	0.583	0.008	12,736	Senegal	0.553	0.011	4,579
Jordan	0.473	0.010	11,438	Sierra Leone	0.516	0.026	1,035
				South Africa	0.383	0.050	343
South Asia				Tanzania	0.510	0.014	3,888
Afghanistan	0.530	0.015	2,802	Togo	0.570	0.039	391
Bangladesh	0.604	0.010	5,477	Uganda	0.668	0.016	1,532
India	0.632	0.003	49,594	Zambia	0.687	0.016	1,487
Nepal	n.a.	n.a.	n.a.	Zimbabwe	0.608	0.021	1,459
Pakistan	0.631	0.004	26,402				

Notes. (1) This table presents the sibling correlation estimates for each of the 53 developing countries in the Demographic and Health Surveys (DHS) using the 1980s birth cohort sample. (2) A higher estimate implies lower mobility.

Table A4: Country-Specific Sibling Correlation Estimates (1990 Birth Cohort)

Country	Sib. Corr.	SE	N	Country	Sib. Corr.	SE	N
East Asia & Pacific				**Sub-Saharan Africa**			
Cambodia	0.610	0.012	4,277	Benin	0.581	0.017	1,854
Indonesia	0.506	0.013	5,508	Burkina Faso	0.515	0.019	1,825
Philippines	0.534	0.009	10,040	Burundi	0.512	0.017	2,479
Vietnam	n.a.	n.a.	n.a.	Cameroon	0.629	0.021	1,502
				Chad	0.752	0.018	1,142
Europe & Central Asia				Congo	0.573	0.051	241
Albania	0.433	0.034	1,269	Cote d'Ivoire	0.579	0.023	1,093
Armenia	0.523	0.051	518	Ethiopia	0.553	0.041	468
Kyrgyz Republic	0.351	0.087	333	Gabon	0.502	0.027	1,121
Tajikistan	0.422	0.029	1,908	Ghana	0.580	0.018	1,996
Turkey	0.492	0.022	2,015	Guinea	0.563	0.026	991
				Kenya	0.484	0.012	6,893
Latin America & Caribbean				Lesotho	0.571	0.019	1,558
Bolivia	0.588	0.118	39	Liberia	0.523	0.026	918
Brazil	n.a.	n.a.	n.a.	Madagascar	0.750	0.011	2,272
Colombia	0.546	0.013	3,765	Malawi	0.580	0.018	2,075
Dominican Republic	0.435	0.043	540	Mali	0.567	0.022	1,277
Guatemala	0.677	0.013	2,579	Mozambique	0.683	0.015	1,945
Haiti	0.673	0.015	2,107	Namibia	0.516	0.061	279
Peru	0.546	0.019	2,588	Niger	0.646	0.040	324
				Nigeria	0.739	0.009	5,954
Middle East & North Africa				Rwanda	0.550	0.015	3,203
Egypt	0.587	0.018	2,958	Senegal	0.546	0.010	6,794
Jordan	0.555	0.009	11,680	Sierra Leone	0.510	0.022	1,743
				South Africa	0.501	0.042	578
South Asia				Tanzania	0.538	0.016	3,004
Afghanistan	0.590	0.011	5,020	Togo	0.521	0.036	463
Bangladesh	0.550	0.010	7,235	Uganda	0.554	0.021	1,726
India	0.608	0.002	186,783	Zambia	0.620	0.016	2,421
Nepal	0.648	0.010	5,874	Zimbabwe	0.612	0.037	500
Pakistan	0.685	0.009	5,136				

Notes. (1) This table presents the sibling correlation estimates for each of the 53 developing countries in the Demographic and Health Surveys (DHS) using the 1990s birth cohort sample. (2) A higher estimate implies lower mobility.

Table A5: Country-Specific Estimates of the Fathers-Children Share in Sibling Correlation using Bingley and Cappellari 2019 Method (1970 Birth Cohort)

Country	Int. Share	SE	N	Country	Int. Share	SE	N
East Asia & Pacific				**Sub-Saharan Africa**			
Cambodia	0.731	0.025	2,305	Benin	0.866	0.039	1,028
Indonesia	0.786	0.010	12,688	Burkina Faso	0.855	0.046	1,307
Philippines	0.815	0.020	4,500	Burundi	n.a.	n.a.	n.a.
Vietnam	0.829	0.022	2,286	Cameroon	0.754	0.068	381
				Chad	n.a.	n.a.	n.a.
Europe & Central Asia				Congo	n.a.	n.a.	n.a.
Albania	n.a.	n.a.	n.a.	Cote d'Ivoire	0.760	0.048	534
Armenia	0.946	0.077	1,099	Ethiopia	0.777	0.019	3,167
Kyrgyz Republic	0.485	0.105	479	Gabon	0.902	0.088	482
Tajikistan	n.a.	n.a.	n.a.	Ghana	0.849	0.045	986
Turkey	0.825	0.027	3,464	Guinea	0.558	0.055	656
				Kenya	0.651	0.036	1,946
Latin America & Caribbean				Lesotho	0.721	0.049	767
Bolivia	0.761	0.018	3,293	Liberia	n.a.	n.a.	n.a.
Brazil	0.757	0.021	1,844	Madagascar	0.858	0.019	1,572
Colombia	0.777	0.017	4,139	Malawi	0.763	0.037	1,264
Dominican Republic	0.700	0.023	3,097	Mali	0.851	0.050	815
Guatemala	0.761	0.017	2,123	Mozambique	0.917	0.058	1,363
Haiti	0.702	0.027	1,299	Namibia	0.685	0.053	866
Peru	0.767	0.011	9,326	Niger	0.707	0.046	762
				Nigeria	0.714	0.042	912
Middle East & North Africa				Rwanda	0.727	0.044	1,521
Egypt	0.792	0.016	11,076	Senegal	0.833	0.054	891
Jordan	0.767	0.031	4,379	Sierra Leone	n.a.	n.a.	n.a.
				South Africa	0.877	0.054	1,325
South Asia				Tanzania	0.606	0.032	2,060
Afghanistan	n.a.	n.a.	n.a.	Togo	0.832	0.069	712
Bangladesh	0.854	0.016	4,206	Uganda	0.791	0.042	838
India	0.828	0.009	20,378	Zambia	0.731	0.028	1,644
Nepal	0.676	0.036	852	Zimbabwe	0.671	0.043	1,231
Pakistan	0.819	0.014	8,072				

Notes. (1) This table presents the estimates of the fathers-children share in sibling correlation using the Bingley and Cappellari (2019) method for each of the 53 developing countries in the Demographic and Health Surveys (DHS) using the 1970s birth cohort sample. (2) The method relaxes the homogeneity, independence, and normality assumptions is estimating the fathers-children association.

Table A6: Country-Specific Estimates of the Fathers-Children Share in Sibling Correlation using Bingley and Cappellari 2019 Method (1980 Birth Cohort)

Country	**Int. Share**	**SE**	**N**	**Country**	**Int. Share**	**SE**	**N**
East Asia & Pacific				**Sub-Saharan Africa**			
Cambodia	0.706	0.014	6,952	Benin	0.847	0.027	2,500
Indonesia	0.788	0.012	10,529	Burkina Faso	0.726	0.031	1,671
Philippines	0.836	0.019	5,107	Burundi	0.727	0.042	1,492
Vietnam	0.867	0.035	1,232	Cameroon	0.841	0.029	1,755
				Chad	0.752	0.034	844
Europe & Central Asia				Congo	0.865	0.046	1,262
Albania	0.865	0.062	1,183	Cote d'Ivoire	0.863	0.056	622
Armenia	0.759	0.036	1,806	Ethiopia	0.726	0.021	3,074
Kyrgyz Republic	0.777	0.086	619	Gabon	0.698	0.058	494
Tajikistan	0.707	0.053	1,612	Ghana	0.793	0.032	1,608
Turkey	0.792	0.026	3,645	Guinea	0.767	0.051	1,049
				Kenya	0.765	0.030	2,617
Latin America & Caribbean				Lesotho	0.736	0.026	3,006
Bolivia	0.708	0.020	3,141	Liberia	0.678	0.052	780
Brazil	n.a.	n.a.	n.a.	Madagascar	0.830	0.015	2,064
Colombia	0.754	0.015	9,092	Malawi	0.766	0.025	2,594
Dominican Republic	0.727	0.024	4,279	Mali	0.749	0.031	1,650
Guatemala	0.798	0.024	1,376	Mozambique	0.824	0.047	1,619
Haiti	0.649	0.021	2,587	Namibia	0.772	0.056	1,055
Peru	0.780	0.012	14,182	Niger	0.708	0.033	1,082
				Nigeria	0.702	0.013	6,102
Middle East & North Africa				Rwanda	0.766	0.034	3,356
Egypt	0.739	0.012	12,736	Senegal	0.779	0.025	4,579
Jordan	0.678	0.021	11,438	Sierra Leone	0.761	0.049	1,035
				South Africa	0.836	0.141	343
South Asia				Tanzania	0.671	0.026	3,888
Afghanistan	0.722	0.029	2,802	Togo	0.846	0.077	391
Bangladesh	0.873	0.018	5,477	Uganda	0.753	0.029	1,532
India	0.760	0.005	49,594	Zambia	0.773	0.026	1,487
Nepal	n.a.	n.a.	n.a.	Zimbabwe	0.695	0.034	1,459
Pakistan	0.814	0.007	26,402				

Notes. (1) This table presents the estimates of the fathers-children share in sibling correlation using the Bingley and Cappellari (2019) method for each of the 53 developing countries in the Demographic and Health Surveys (DHS) using the 1980s birth cohort sample. (2) The method relaxes the homogeneity, independence, and normality assumptions is estimating the fathers-children association.

Table A7: Country-Specific Estimates of the Fathers-Children Share in Sibling Correlation using Bingley and Cappellari 2019 Method (1990 Birth Cohort)

Country	Int. Share	SE	N	Country	Int. Share	SE	N
East Asia & Pacific				**Sub-Saharan Africa**			
Cambodia	0.660	0.017	4,277	Benin	0.796	0.030	1,854
Indonesia	0.772	0.022	5,508	Burkina Faso	0.663	0.033	1,825
Philippines	0.728	0.016	10,040	Burundi	0.632	0.030	2,479
Vietnam	n.a.	n.a.	n.a.	Cameroon	0.870	0.033	1,502
				Chad	0.694	0.024	1,142
Europe & Central Asia				Congo	0.761	0.077	241
Albania	0.721	0.064	1,269	Cote d'Ivoire	0.769	0.036	1,093
Armenia	0.619	0.078	518	Ethiopia	0.682	0.061	468
Kyrgyz Republic	0.537	0.161	333	Gabon	0.799	0.059	1,121
Tajikistan	0.588	0.051	1,908	Ghana	0.710	0.027	1,996
Turkey	0.563	0.033	2,015	Guinea	0.723	0.041	991
				Kenya	0.822	0.026	6,893
Latin America & Caribbean				Lesotho	0.775	0.032	1,558
Bolivia	0.683	0.136	39	Liberia	0.699	0.047	918
Brazil	n.a.	n.a.	n.a.	Madagascar	0.797	0.016	2,272
Colombia	0.706	0.022	3,765	Malawi	0.746	0.029	2,075
Dominican Republic	0.838	0.097	540	Mali	0.693	0.036	1,277
Guatemala	0.722	0.019	2,579	Mozambique	0.749	0.022	1,945
Haiti	0.626	0.022	2,107	Namibia	0.818	0.106	279
Peru	0.733	0.031	2,588	Niger	0.695	0.054	324
				Nigeria	0.696	0.011	5,954
Middle East & North Africa				Rwanda	0.666	0.027	3,203
Egypt	0.658	0.025	2,958	Senegal	0.725	0.018	6,794
Jordan	0.548	0.015	11,680	Sierra Leone	0.609	0.033	1,743
				South Africa	0.592	0.070	578
South Asia				Tanzania	0.670	0.025	3,004
Afghanistan	0.557	0.016	5,020	Togo	0.837	0.070	463
Bangladesh	0.709	0.016	7,235	Uganda	0.704	0.036	1,726
India	0.677	0.003	186,783	Zambia	0.729	0.025	2,421
Nepal	0.667	0.012	5,874	Zimbabwe	0.731	0.055	500
Pakistan	0.760	0.013	5,136				

Notes. (1) This table presents the estimates of the fathers-children share in sibling correlation using the Bingley and Cappellari (2019) method for each of the 53 developing countries in the Demographic and Health Surveys (DHS) using the 1990s birth cohort sample. (2) The method relaxes the homogeneity, independence, and normality assumptions is estimating the fathers-children association.

Table A8: Sibling Correlation Estimates for the Sample Consisting of the 20-28 Year Age Range of Children in a Survey Round (Full Sample: 1960s-1990s birth cohorts)

Country	**Sib. Corr.**	**SE**	**N**	**Country**	**Sib. Corr.**	**SE**	**N**
East Asia & Pacific				**Sub-Saharan Africa**			
Cambodia	0.638	0.010	5,456	Benin	0.626	0.015	2,005
Indonesia	0.649	0.006	15,267	Burkina Faso	0.568	0.019	1,751
Philippines	0.566	0.009	10,183	Burundi	0.546	0.023	1,335
Vietnam	0.688	0.017	1,612	Cameroon	0.600	0.018	1,529
				Chad	0.745	0.022	752
Europe & Central Asia				Congo	0.515	0.031	692
Albania	0.504	0.033	980	Cote d'Ivoire	0.561	0.023	1,096
Armenia	0.547	0.023	1,822	Ethiopia	0.704	0.011	3,092
Kyrgyz Republic	0.488	0.040	683	Gabon	0.464	0.032	928
Tajikistan	0.485	0.024	1,764	Ghana	0.606	0.019	1,677
Turkey	0.536	0.012	4,573	Guinea	0.542	0.026	1,038
				Kenya	0.523	0.016	3,913
Latin America & Caribbean				Lesotho	0.602	0.013	2,642
Bolivia	0.707	0.013	2,756	Liberia	0.531	0.030	697
Brazil	0.702	0.018	1,290	Madagascar	0.723	0.014	2,376
Colombia	0.633	0.008	8,136	Malawi	0.585	0.018	1,770
Dominican Republic	0.569	0.013	3,559	Mali	0.634	0.019	1,375
Guatemala	0.736	0.010	2,697	Mozambique	0.570	0.019	1,904
Haiti	0.661	0.013	2,560	Namibia	0.492	0.030	1,121
Peru	0.636	0.007	13,392	Niger	0.659	0.022	946
				Nigeria	0.675	0.010	5,719
Middle East & North Africa				Rwanda	0.550	0.014	3,064
Egypt	0.546	0.007	14,996	Senegal	0.546	0.010	6,111
Jordan	0.479	0.008	16,742	Sierra Leone	0.531	0.026	1,075
				South Africa	0.517	0.026	1,200
South Asia				Tanzania	0.542	0.015	3,454
Afghanistan	0.566	0.013	3,694	Togo	0.517	0.035	611
Bangladesh	0.611	0.008	7,342	Uganda	0.648	0.019	1,262
India	0.615	0.002	129,567	Zambia	0.632	0.016	2,066
Nepal	0.629	0.015	2,476	Zimbabwe	0.611	0.024	1,163
Pakistan	0.624	0.005	22,076				

Table A9: Sibling Correlation Estimates for the Sample Consisting of the 18-25 Year Age Range of Children in a Survey Round (Full Sample: 1960s-1990s birth cohorts)

Country	**Sib. Corr.**	**SE**	**N**	**Country**	**Sib. Corr.**	**SE**	**N**
East Asia & Pacific				**Sub-Saharan Africa**			
Cambodia	0.639	0.009	8,790	Benin	0.617	0.015	3,424
Indonesia	0.634	0.006	22,740	Burkina Faso	0.552	0.017	3,028
Philippines	0.563	0.008	14,441	Burundi	0.558	0.018	2,380
Vietnam	0.672	0.016	2,453	Cameroon	0.629	0.019	2,406
				Chad	0.733	0.019	1,314
Europe & Central Asia				Congo	0.541	0.027	1,133
Albania	0.444	0.034	1,571	Cote d'Ivoire	0.583	0.021	1,710
Armenia	0.546	0.022	2,387	Ethiopia	0.664	0.010	5,072
Kyrgyz Republic	0.458	0.049	987	Gabon	0.479	0.031	1,410
Tajikistan	0.444	0.029	2,368	Ghana	0.586	0.017	2,989
Turkey	0.529	0.012	6,850	Guinea	0.547	0.023	1,709
				Kenya	0.521	0.014	7,136
Latin America & Caribbean				Lesotho	0.603	0.014	3,875
Bolivia	0.686	0.013	4,342	Liberia	0.532	0.029	1,153
Brazil	0.690	0.017	1,920	Madagascar	0.738	0.012	4,053
Colombia	0.624	0.009	11,661	Malawi	0.595	0.015	3,472
Dominican Republic	0.575	0.013	5,310	Mali	0.608	0.018	2,327
Guatemala	0.727	0.011	4,238	Mozambique	0.555	0.018	3,149
Haiti	0.667	0.012	3,907	Namibia	0.532	0.029	1,714
Peru	0.622	0.007	19,252	Niger	0.657	0.020	1,377
				Nigeria	0.690	0.010	9,072
Middle East & North Africa				Rwanda	0.554	0.012	5,376
Egypt	0.552	0.008	21,413	Senegal	0.544	0.011	8,847
Jordan	0.491	0.009	20,989	Sierra Leone	0.510	0.024	1,849
				South Africa	0.544	0.029	1,694
South Asia				Tanzania	0.527	0.014	6,034
Afghanistan	0.579	0.012	5,583	Togo	0.514	0.029	1,042
Bangladesh	0.618	0.008	11,603	Uganda	0.624	0.017	2,311
India	0.625	0.002	187,522	Zambia	0.645	0.013	3,783
Nepal	0.644	0.014	4,248	Zimbabwe	0.594	0.021	2,075
Pakistan	0.632	0.005	29,373				

Table A10: Cohort-wise Sibling Correlation Estimates for the Sample Consisting of the 20-28 Year Age Range of Children in a Survey Round (the 1970s, the 1980s, and the 1990s birth cohorts)

Country	1970s	1980s	1990s	Country	1970s	1980s	1990s
East Asia & Pacific				**Sub-Saharan Africa**			
Cambodia	0.656	0.646	0.614	Benin	0.652	0.625	0.608
Indonesia	0.674	0.639	0.555	Burkina Faso	0.515	0.625	0.538
Philippines	0.582	0.603	0.529	Burundi	n.a.	0.565	0.507
Vietnam	0.690	0.672	n.a.	Cameroon	0.649	0.597	0.578
				Chad	n.a.	0.733	0.768
Europe & Central Asia				Congo	n.a.	0.538	n.a.
Albania	n.a.	0.562	0.414	Cote d'Ivoire	0.674	0.563	0.548
Armenia	0.505	0.582	0.545	Ethiopia	0.657	0.652	n.a.
Kyrgyz Republic	0.477	0.523	n.a.	Gabon	0.438	0.604	0.384
Tajikistan	n.a.	0.488	0.470	Ghana	0.572	0.648	0.620
Turkey	0.551	0.543	0.477	Guinea	0.624	0.484	0.564
				Kenya	0.624	0.583	0.460
Latin America & Caribbean				Lesotho	0.603	0.609	0.583
Bolivia	0.715	0.687	n.a.	Liberia	n.a.	0.545	0.483
Brazil	0.736	n.a.	n.a.	Madagascar	0.803	0.803	0.720
Colombia	0.676	0.592	0.581	Malawi	0.587	0.616	0.466
Dominican Republic	0.590	0.520	0.459	Mali	0.625	0.640	0.616
Guatemala	0.796	0.703	0.714	Mozambique	0.529	0.510	0.682
Haiti	0.687	0.650	0.644	Namibia	0.543	0.514	n.a.
Peru	0.670	0.602	n.a.	Niger	0.632	0.677	n.a.
				Nigeria	0.618	0.662	0.725
Middle East & North Africa				Rwanda	0.590	0.541	0.586
Egypt	0.523	0.602	0.664	Senegal	0.555	0.548	0.531
Jordan	0.475	0.467	0.518	Sierra Leone	n.a.	0.525	0.533
				South Africa	0.565	0.344	0.613
South Asia				Tanzania	0.594	0.531	0.553
Afghanistan	n.a.	0.542	0.609	Togo	0.450	0.565	0.522
Bangladesh	0.673	0.596	0.545	Uganda	0.645	0.709	0.527
India	0.606	0.624	0.612	Zambia	0.679	0.647	0.601
Nepal	0.544	n.a.	0.643	Zimbabwe	0.609	0.601	0.662
Pakistan	0.595	0.629	0.689				

Table A11: Cohort-wise Sibling Correlation Estimates for the Sample Consisting of the 18-25 Year Age Range of Children in a Survey Round (the 1970s, the 1980s, and the 1990s birth cohorts)

Country	1970s	1980s	1990s	Country	1970s	1980s	1990s
East Asia & Pacific				**Sub-Saharan Africa**			
Cambodia	0.683	0.638	0.624	Benin	0.674	0.617	0.589
Indonesia	0.659	0.637	0.528	Burkina Faso	0.583	0.590	0.488
Philippines	0.645	0.604	0.511	Burundi	n.a.	0.604	0.506
Vietnam	0.693	0.635	n.a.	Cameroon	n.a.	0.639	0.617
				Chad	n.a.	0.724	0.748
Europe & Central Asia				Congo	n.a.	0.548	0.439
Albania	n.a.	0.503	0.409	Cote d'Ivoire	0.634	0.574	0.583
Armenia	0.470	0.590	0.530	Ethiopia	0.665	0.605	0.654
Kyrgyz Republic	0.449	0.517	0.332	Gabon	0.493	0.536	0.450
Tajikistan	n.a.	0.430	0.456	Ghana	0.551	0.611	0.575
Turkey	0.546	0.543	0.467	Guinea	0.587	0.518	0.554
				Kenya	0.597	0.611	0.465
Latin America & Caribbean				Lesotho	n.a.	0.617	0.573
Bolivia	0.701	0.671	n.a.	Liberia	n.a.	0.506	0.558
Brazil	0.693	n.a.	n.a.	Madagascar	0.828	0.797	0.709
Colombia	0.700	0.597	0.558	Malawi	0.618	0.621	0.529
Dominican Republic	0.621	0.538	0.457	Mali	0.633	0.632	0.561
Guatemala	0.768	0.660	0.702	Mozambique	0.511	0.477	0.677
Haiti	0.671	0.660	0.667	Namibia	0.607	0.515	0.440
Peru	0.667	0.590	0.567	Niger	0.620	0.674	0.648
				Nigeria	0.689	0.659	0.727
Middle East & North Africa				Rwanda	0.556	0.547	0.574
Egypt	0.522	0.591	0.598	Senegal	0.547	0.540	0.538
Jordan	0.453	0.471	0.532	Sierra Leone	n.a.	0.522	0.500
				South Africa	0.543	n.a.	0.559
South Asia				Tanzania	0.571	0.520	0.528
Afghanistan	n.a.	0.522	0.598	Togo	0.434	n.a.	0.509
Bangladesh	0.697	0.616	0.546	Uganda	0.668	0.673	0.550
India	0.618	0.660	0.620	Zambia	0.638	0.728	0.608
Nepal	0.575	n.a.	0.663	Zimbabwe	0.591	0.596	0.625
Pakistan	0.638	0.621	0.692				

Table A12: Cross-Country Ranking by Alternative Measures of Relative Mobility: Sibling Correlation vs. IGRC and IGC Estimates of Van der Weide et al. (2023)

	1980 Cohort			1970 Cohort		
Country	**Sib. Corr. Rank**	**IGRC Rank**	**IGC Rank**	**Sib. Corr. Rank**	**IGRC Rank**	**IGC Rank**
South Africa	1	2	3	7	6	19
Kyrgyz Republic	2	6	13	1	1	2
Tajikistan	3	3	2	n.a.	4	16
Jordan	4	4	6	5	2	5
Mozambique	5	37	19	8	n.a.	n.a.
Albania	6	14	5	n.a.	14	9
Tanzania	7	17	16	11	5	10
Sierra Leone	8	45	43	n.a.	n.a.	n.a.
Guinea	9	42	34	20	13	22
Afghanistan	10	28	25	n.a.	n.a.	n.a.
Rwanda	11	23	7	10	22	18
Namibia	12	7	32	12	n.a.	n.a.
Turkey	13	32	26	9	24	20
Liberia	14	8	10	n.a.	12	13
Congo	15	30	48	n.a.	n.a.	n.a.
Senegal	16	44	40	14	n.a.	n.a.
Togo	17	39	42	2	23	17
Armenia	18	20	15	4	9	4
Burundi	19	29	9	n.a.	28	11
Kenya	20	5	18	13	3	7
Colombia	21	21	30	34	27	28
Egypt	22	15	20	6	17	14
Peru	23	16	27	35	21	25
Lesotho	24	25	35	17	n.a.	n.a.
Cote d'Ivoire	25	41	36	28	n.a.	n.a.
Benin	26	50	44	30	34	29
Gabon	27	12	8	3	8	3
Bangladesh	28	40	45	36	n.a.	n.a.
Malawi	29	10	14	18	15	15
Burkina Faso	30	51	51	15	n.a.	n.a.
Philippines	31	1	1	21	7	23
Ghana	32	27	41	16	16	26
Ethiopia	33	47	17	37	33	8
Vietnam	34	22	33	38	26	36
Mali	35	49	47	25	25	24
Indonesia	36	11	22	32	18	31
Cameroon	37	33	50	26	n.a.	n.a.
Pakistan	38	31	37	19	35	35
India	39	34	39	23	31	32
Cambodia	40	26	11	31	n.a.	n.a.
Bolivia	41	19	38	39	32	34
Uganda	42	18	21	29	10	12
Nigeria	43	24	23	24	11	6
Haiti	44	36	31	40	n.a.	n.a.
Niger	45	38	12	27	19	1
Zambia	46	13	4	33	n.a.	n.a.
Guatemala	47	48	49	42	36	33
Chad	48	35	28	n.a.	n.a.	n.a.
Madagascar	49	46	46	43	29	30
Brazil	n.a.	9	29	41	20	27
Nepal	n.a.	43	24	22	30	21

Notes. The IGRC and IGC estimates are extracted from Van der Weide et al. (2023). n.a. stands for Not Available.

Table A13: Comparison of Sibling Correlation with the IGRC and IGC Estimates of Neidhofer et al. (2018) for Latin American Countries

Country	**IGRC**		**IGC**		**Sib. Corr.**	
	1970s	**1980s**	**1970s**	**1980s**	**1970s**	**1980s**
Bolivia	0.455	0.441	0.58	0.58	0.692	0.655
Colombia	0.502	0.438	0.521	0.484	0.668	0.580
Dominican Republic	0.336	0.355	0.353	0.404	0.595	0.538
Guatemala	0.639	0.62	0.542	0.494	0.747	0.697
Peru	0.406	0.383	0.519	0.517	0.668	0.585

Notes. The IGRC and IGC estimates are extracted from Neidhofer et al. (2018).

Table A14: The Fathers-Children Share in Sibling Correlation based on IGC Estimates of Van der Weide et al. (2023)

Country	1980 Cohort		1970 Cohort		**Country**	1980 Cohort		1970 Cohort	
	IGC	**SHARE**	**IGC**	**SHARE**		**IGC**	**SHARE**	**IGC**	**SHARE**
South Africa	0.307	0.246	0.427	0.350	Malawi	0.420	0.293	0.416	0.284
Kyrgyz Republic	0.405	0.375	0.312	0.256	Gabon	0.382	0.238	0.334	0.235
Tajikistan	0.286	0.177			Bangladesh	0.568	0.525		
Jordan	0.373	0.298	0.358	0.270	Vietm	0.510	0.423	0.583	0.498
Albania	0.359	0.256			Philippines	0.157	0.040	0.456	0.339
Guinea	0.511	0.508	0.442	0.326	Indonesia	0.471	0.360	0.514	0.401
Sierra Leone	0.558	0.603			Ghana	0.543	0.478	0.482	0.392
Mozambique	0.453	0.393			Nepal	0.481	0.375	0.436	0.298
Afghanistan	0.484	0.448			Mali	0.573	0.531	0.475	0.361
Congo	0.575	0.623			Cameroon	0.593	0.560		
Liberia	0.394	0.290			India	0.535	0.453	0.520	0.410
Namibia	0.505	0.476			Pakistan	0.522	0.430	0.579	0.563
Rwanda	0.379	0.260	0.425	0.332	Burkina Faso	0.612	0.587		
Turkey	0.488	0.424	0.435	0.344	Bolivia	0.525	0.422	0.577	0.481
Tanzania	0.439	0.342	0.384	0.264	Ethiopia	0.450	0.308	0.367	0.170
Togo	0.549	0.529	0.425	0.405	Cambodia	0.397	0.240		
Egypt	0.461	0.366	0.409	0.321	Uganda	0.463	0.322	0.393	0.239
Colombia	0.497	0.424	0.501	0.376	Nigeria	0.481	0.347	0.358	0.200
Burundi	0.383	0.252			Haiti	0.501	0.372		
Kenya	0.452	0.350	0.359	0.230	Zambia	0.311	0.142		
Senegal	0.540	0.500			Niger	0.400	0.234	0.248	0.092
Peru	0.492	0.409	0.481	0.346	Guatemala	0.576	0.476	0.575	0.441
Cote d'Ivoire	0.521	0.459			Chad	0.495	0.336		
Armenia	0.425	0.306	0.354	0.267	Madagascar	0.572	0.414	0.514	0.320
Lesotho	0.515	0.448			Brazil			0.492	0.341
Benin	0.568	0.542	0.511	0.400					

Notes. The IGC estimates are extracted from Van der Weide et al. (2023).