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ORIGINAL PAPER

Measuring Education Changes Between Generations: Evidence for 52 Developing Countries from 1870 to 2010

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Abstract
This work measures the education changes between generations for a sample of 52 developing countries (Latin America, 15; Asia and the Pacific, 13; the Middle East, 6; and Africa, 18) from 1870 to 2010. Results show that the intergenerational correlations of Pearson-Spearman indices in the developing world are higher than $\rho = 0.90$, with those cases in which the existing correlation between individuals of the same gender exceeds values higher than $\rho = 0.95$ being especially noteworthy. The OLS estimations show intergenerational indices between 0.67 and 0.99, with Asia and Pacific being the region with the highest values, and Latin America being the developing region with the lowest indices. All four regions show a significantly high level of educational transmission between generations, with this lack of educational mobility appearing to be one reason for the stagnation of growth and economic development in these regions.

Keywords Education changes · Intergenerational analysis · Developing countries · 1870–2010

JEL Classification I24 · I25 · N30 · O15

Introduction

Developing countries are particularly concerned with the increase in their economic inequality and, in this context, the intergenerational persistence of education is a barrier to equal opportunities in children's education attainments and their future labor market outcomes. Through the lens of family economics, Li (2021) reviewed a number of papers on this topic, with particular reference to the degree of parental involvement in children's education, and indicated future research directions. In this context, the measurement of education between generations has become a topic of special relevance in economics. It is true that the literature has analyzed the intergenerational transmission of different specific variables (Ferrando-Latorre et al., 2019; Sánchez-Martín & García-Pérez, 2023; Stranges, 2022), but we assume here that the level of education stands out for its importance, although, unfortunately, the literature has largely focused on developing countries and for periods no longer than four or five decades.

The first estimates on the transmission of education between generations were made for the case of the United States (Bowles, 1972; Spady, 1967). With regard to studies that attempt to carry out international comparisons, research by Couch and Dunn (1997) on the United States and Germany stands out, as does the work of Broucker and Underwood (1998), who analyze eleven countries. The recent literature on the transmission of education in developing economies only corresponds to the work carried out in individual countries, such as Panama (Heckman & Hotz, 1986), Malaysia (Lillard & Willis, 1994), South Africa (Hertz, 2001), Brazil, Colombia, Mexico and Peru (Behrman et al., 2001), Mexico (Binder & Woodruff, 2002), and China (Sato & Shi, 2007). Specifically, for the last two decades, we highlight cross-country analysis for Africa (Azomahou and Yitbarek, 2021; Hertz et al., 2007a, 2007b; Razzu & Wambile, 2022), and for Latin America (Neidhöfer et al., 2018, 2021). With respect to Asia, Emran and Shilpi (2015) show results for India, and Magnani and Zhu (2015) for China. Results in these papers show that the pattern of educational mobility at the intergenerational level continues to be somewhat

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stagnant in terms of macro-regional analysis, focused on the study of still-developing economies. The magnitude of the coefficients obtained supports this conclusion, since the majority of cases barely fall below 0.6, in some cases even reaching coefficients close to unity, suggesting absolute intergenerational dependence.

In this context, our work provides homogeneously comparable evidence on the measurement of intergenerational education in different developing areas of the world over a long period, from 1870 to 2010. We have data from 52 countries, located throughout the main underdeveloped regions of the planet: Latin America (15), Asia and the Pacific (13), the Middle East (6), and Africa (18). The complete list of the countries under study allows for a homogeneous analysis of educational intergenerational mobility in the development areas of the world that until now has not appeared in the literature. Given the extensive time horizon considered, it has been possible to obtain new conclusions about the evolution of educational levels in these areas of the world. The configuration of different regional profiles allows us to carry out a complete comparative analysis, emphasizing those nuances that clearly make them different, paying attention to those common features that may explain part of the stagnation experienced by some of these regions, not only in educational terms, but also in social and economic terms.

The empirical results are obtained using the methods that the literature has specified to capture the transmission of educational performance between different generations. In a general way, such studies usually use ordered probits or OLS linear regressions. In our case, we take advantage of the particularity of the database to use a third method, prior to the two econometric estimates.

The first consists of carrying out the analysis of educational intergenerational mobility through a calculation of the Pearson Spearman correlation coefficient, which allows us to analyze the degree of persistence between the academic achievement achieved by one generation compared to that achieved by the next. The second method allows for calculating the probability that an individual faces when reaching a certain level of educational achievement, based on the level demonstrated by their parents. This is possible thanks to specifying the dependent variable as a dichotomous variable based on the academic performance shown by the ancestors, and subsequently running the corresponding estimate. The third method allows for the estimation of a coefficient corresponding to a linear regression carried out using Ordinary Least Squares (OLS). This method reveals the linear approximation of the process of transmission of education through generations and reflects the elasticity of the child's education with respect to that of the father.

The first clear differentiation proposed with respect to the literature refers to the used data. Most of the articles cited use databases from a social survey system. In fact, reference works have managed to configure widely informative databases, due to creating follow-up networks in families. This makes it possible to estimate the equations using the data recorded regarding the current educational achievement of the children and establish a mechanism for comparison with the academic performance of the parents when they were the same age as the children are today.

However, this work, unlike the prior literature dominated by the survey method, allows us to visualize in a better and much more coherent way the evolution and trajectory followed. That is why, thanks to the timing selected to carry out the sample of countries and, above all, the heterogeneity presented by each of them, the performance of macro-regional analysis allows us to draw important conclusions, and results that encompass the origins and cultural particularities that condition subsequent development. The socio-cultural roots determine the institutional development, in terms of dictating the educational regulations of these regions, which is why the cultural role takes on special importance. Similarly, the time horizon contemplates a spectrum wide enough to obtain a long-term vision about the various changes that have taken place within the educational systems of these countries and how this development has influenced educational mobility, therefore being an explanatory cause of this process.

Another fundamental contribution of this work is the integration of a differentiating analysis by gender, exploited through the Pearson Spearman indices. The particularity of the database used has made it possible to determine the influence on educational achievement of the generation of descendants based on the gender of the ascendant, noting how this differentiation conditions the subsequent process of educational transmission of the children, according to their gender. The results obtained are especially important, making it possible to appreciate a clear discriminatory bias in favor of men.

The structure of the work is organized as follows. The following section provides a review of the literature. The next section presents the empirical models used to estimate the intergenerational educational mobility during the period 1870–2010. The next section includes a description of data. Next, we present empirical results for each of the mobility indices, describing in each case the patterns and trends of intergenerational mobility in the countries under study and, finally, we show our conclusions.

Review of the Literature

The fundamental theoretical framework of transmission between generations allows us to ascertain the degree of intergenerational mobility existing in a given country or region. The classical literature from the 1970s to the early

2000s indicates a number of relevant issues. First, education level is not the only useful measure to enable conclusions about social status, as indicated by Ganzeboom et al. (1991), although these authors add to the prior literature of Becker and Tomes (1986), Bowles (1972), Loury (1981), and Solon (1992), who all indicate that education is itself a key aspect of occupational status, prestige, and income obtained as a result of professional status. On this basis, these authors conceptualize the transmission mechanisms and channels to explain the degree of intergenerational mobility between the economic results of parents and children. In these models, transmission from the first generation to the next is primarily related to inherited abilities and parental investments in education.

Other studies, such as Solon (2004), show that structural components, like public investment in human capital, are related to the association observed between the results of parents and children, in such a way that intergenerational mobility depends on more than the inheritance of skills or the effectiveness of investment in human capital. Hassler and Mora (2000) affirm that technological growth decreases the relative importance of social antecedents, while promoting the intrinsic role of talent in achieving higher future levels of growth.

Influential theoretical studies have examined the relationship between the quality of education and intergenerational mobility. A higher quality of teaching causes a greater disparity of investment in human capital between rich and poor (Becker and Tomes, 1986). Meanwhile, upward mobility within low-status families increases the profitability of highly qualified individuals, belonging in most cases to families with a better economic status, leading to a lower return on higher education and, in consequence, a lower level of educational quality (Hassler et al., 2007).

These models show that greater intergenerational mobility, that is, less transmission between generations, favors growth and economic development in the current state (Owen & Weil, 1998), but also when applied from a dynamic perspective (Maoz & Moav, 1999). In fact, such is its importance that authors like Checchi (2001) show that education has become the cause of the total effect of intergenerational mobility in all its fields of application. Undoubtedly, the framework for the elaboration and application of different policies will have a clear differentiating component.

Additionally, a recent survey by Li (2021) summarizes a number of papers that show how parental involvement, parenting style, parent's socioeconomic status, and parents working hours could have an important impact on children's educational outcomes. Thus, Majumder (2016), Neymotin (2014), and Stacer and Perrucci (2013) show how much parental involvement is important in improving children's academic achievements. Campos-Vazquez (2018) specifically shows how the socioeconomic status of parents is related to the formation and development of skills of teenage children.

Given the objective of our paper, we now summarize the literature for developing countries during the two recent decades. We also include some papers from the specific gender perspective given that in developing countries the gender culture against female education may have effects on the educational attainments of women (King & Hill, 1993).

For the case of Africa, Razzu and Wambile (2022) measure the extent of transmission in educational outcomes for 34 African countries using nationally representative surveys since 1960, covering a broader set of countries than prior analyses, whereas Azomahou and Yitbarek (2021) and Hertz et al., (2007a, 2007b) covered 9 and 4 African countries, respectively, with all these authors finding that intergenerational education mobility in Africa is low, with the educational status of parents remaining a strong determinant of children's schooling outcomes. These papers show that countries in the Southern African sub-region have generally higher mobility than countries in the other sub-regions of Eastern, Central, and Western Africa and, additionally, they show that the intergenerational education link is overall more persistent for daughters than for sons.

On the other hand, Neidhöfer et al. (2021) use the *Latinobarómetro* data to focus on the association of parental education with the education of their children for 18 Latin American countries, for the period 1998–2018. These results with the *Latinobarómetro* data, which are highly consistent to estimates obtained with national household surveys in a previous paper (Neidhöfer et al. (2018), show a positive trend in intergenerational mobility in most countries in the region, with the highest values appearing in Ecuador, Venezuela, and Peru, and the lowest values in Nicaragua and Honduras. From a gender perspective, Campaña et al. (2017) analyzed the human capital of children in some Latin American countries. Authors show that in Mexico, Peru, and Colombia the level of education of both father and mother has a positive association with the time devoted to educational childcare, while in Ecuador only fathers' level of education has a positive association with father's time devoted to educational childcare.

With respect to Asia, Emran and Shilpi (2015) show that intergenerational correlations of education show strong persistence in India, stronger than in Latin America. Additionally, Magnani and Zhu (2015) examine the impact of parental education on the education of children using the 1990 and 2000 Chinese Population Censuses, finding evidence of increasing parent–child education correlations. Aydemir and Yazici (2019) adopt a gender perspective to explore the intergenerational education mobility in Turkey, with these authors showing that regions that feature more favorable gender culture also feature higher mobility for daughters.

At the level of education, government intervention corresponds to the individual action plan carried out by each country, with the particularities of each defining each system. In short, the analysis of intergenerational transmission in the educational field allows us to go beyond the purely economic horizon and establish all kinds of conclusions about the formulation of policies linked to current education systems, the years of compulsory education, and the prohibition of work by children. This means that, as the action is more direct, it is expected to achieve the desired results with greater certainty. However, most of the empirical literature encounters serious difficulties in documenting a sufficiently firm interpretation of the results obtained, which allow clear guidelines on how to address such challenges.

Measuring Intergenerational Educational Mobility

Intergenerational Educational Correlation

The first way to carry out the measurement of educational intergenerational mobility is by estimating the Pearson Spearman correlation coefficient, with high coefficients meaning low intergenerational mobility. This index captures the pure positional change aspect of mobility, by establishing directly to what extent the educational achievement of the child is related to that previously obtained by the father. The key variables will always refer to the educational results of the parents (E_{jk}^{p}) and the educational results of the children (E_{jk}^{c}) measured by the average years of education for each of the t periods that make up the sample. The indices are estimated separately for each region (j) and each country (k), thus obtaining a specific and global double vision of each of the developing regions. In addition, the separation by gender is done to reach conclusions about the degree of participation of both sexes within the field of mobility:

$$\rho_{jk} = \frac{cov\left(\sigma_{E_{jk}^{c}}, \sigma_{E_{jk}^{p}}\right)}{\sigma_{E_{jk}^{c}} * \sigma_{E_{jk}^{p}}} \tag{1}$$

The calculation of this index makes it possible to expand the comparative statics, not only between the countries that make up the sample, but also by differentiating by gender. In short, it offers a broad and intuitive vision of educational transmission, in this case, of a certain region. For this reason, the calculation of this index is presented as a complementary indicator to econometric modeling, to further complete the statistical inference of the data used.

Ordered Probit

Second, the ordered probit allows the dependent variable to be treated categorically in terms of educational attainment. The use of this technique is adequate to evaluate the levels of education achieved, organized in hierarchical categories. The econometric specification used is a model built around the following latent variable regression:

$$E_i^{*} = \beta X_i + \varepsilon_i \tag{2}$$

where E_i^{*} is the unobservable dependent variable, that is, the probability of attaining a certain educational achievement by individual i depending on the educational level presented by their parents. The vector X_i of independent variables is found, which, in this case, only contains information on the educational achievement of the parents. The term ε_i represents other unobservable factors of the estimate. Given the normal function associated with the random disturbance, the model is estimated using a standardized normal distribution function. The following expression reflects the probability that individual i reaches an educational level j:

$$Prob\left[E_i = j\right] = \left(\frac{1}{\sqrt{2\pi}}\right) \int_{-\infty}^{\alpha+\beta*X_i} e^{-z^2/2} dz \tag{3}$$

Expression (2) has been used to analyze the impact of educational attainment of individuals on the probability distribution of the level of education attained by the next generation. This method allows for the discovery of the marginal effects (computed between 0 and 1), in such a way that the indices obtained reflect the probabilities that the children reach a degree of education conditional on the education of their parents, thus allowing us to draw important conclusions about the distribution and equality of opportunity between the different social groups.

OLS Methodology

The third method used to carry out the estimation of educational intergenerational mobility is a linear regression model, with E_{jk}^{c} representing the average years of education of the child inhabitants of country k belonging to region j, and E_{jk}^{p} is defined as the average years of education of the parents also living in country k belonging to region j. These two key variables are expressed in logarithmic terms as a sample of the representation of the experienced long-term behavior. A parameter is specified that accompanies the independent variable as a sample of the population correlation measuring the degree of mobility between both generations. It is assumed that the population variance in E is the same in the two generations, which gives

the possibility of estimating the regression using the OLS methodology:

$$E_{jk}^{c} = \alpha + \beta E_{jk}^{p} + \varepsilon_i \quad (4)$$

where α is the constant term and the parameter ε_i is the stochastic term, distributed according to a normal distribution with mean 0 and variance σ^2, N (0; σ^2). The β component indicates the degree of educational intergenerational mobility between generations, in such a way that there will be a perfect intergenerational mobility when β = 0, understanding in this case that the child's educational achievement is completely independent of that shown by the father. There is null mobility or immobility when β = 1, with the educational performance of the child totally depending on that previously achieved by the father.

Data and Descriptive Analysis

The fifty-two sample developing countries are listed in Tables 1 and 2. The data used have come from a database prepared from an initial sample proposed by Lee, and Barro (v. 1.0, January 2016), renamed "Barro & Lee Educational Attainment Dataset" (Persson, 2013). This is complemented by national surveys of countries from different regions, which makes it possible to configure a substantial list suitable for our purpose. The proposed time horizon (from 1870 to 2010) has not been contemplated before in the literature, and is broad enough to provide a global perspective.

One important aspect is the determination of the age range for the individuals in the sample, since individuals between age 15 and age 25 are considered as children. The lower age limit ensures that the individuals are old enough to have finished a formal educational cycle, thus avoiding biased estimates, while the upper limit is intended to assess mobility among the last segment of the population for whom a formal schooling process has ended. In this way, we avoid problems that arise from an excessive extension of the upper age limit, since education and longevity are correlated, as pointed out by Behrman et al. (2001). Therefore, in this hypothesis, problems related to downwardly biased estimates of the intergenerational regression coefficient do not arise. With this scheme, we expect that the individuals selected as parents in the sample have a lower level of education than the individuals considered as descendants, and, therefore, a first approximation indicative of educational mobility between the two generations. The Tables with the most prominent records of the selected sample are presented, as well as a complete graphic instrument for each region.

The descriptive analysis shown in Tables 1 and 2, together with the graphic instruments, in which a comparison is made about the evolution in terms of academic performance from one generation to another, provides a first approach to the intergenerational aspect of educational transmission for the sample countries within the considered time horizon. Each of the regions under study has experienced notable improvements in educational achievement, as shown by the growing and positive trajectory of the different graphs, as well as in terms of the average years of study observed since the generation of the parents in comparison to the children. In addition, broadly speaking, the consonance between the different instruments seems to persist, which is why it is a good indicator with regard to the development of the educational systems of these regions. Placing greater emphasis on the characteristics of each region, clear differences can be observed, as well as completely different behavior patterns between different areas, providing a much clearer view.

In the case of the countries that make up the Latin American region, it can be seen that, on average, the transmission of educational performance from one generation to the next has been particularly remarkable, going from an average of 2.51 years for the parents to an average value of 4 years in the case of the children. However, this is not an outstanding improvement in the educational systems of the region. Very similar results can be observed for the Asia and Pacific region, where the average improvement threshold has been around 3.28 years for the children compared to 1.17 years recorded for the children.

For the countries that make up the sample of the two remaining regions, Africa and the Middle East, despite the fact that a clear positive and growing trend has been observed with regard to the average evolution of years of education, progress in educational terms does not seem remarkable. Even so, in the case of Africa, a dynamic evolution has been observed of almost 2.5 years on average for the children, while the Middle East region shows significant progress, with the improvement ratio evolving from 1.06 to 2.42 years from one generation to the next.

Continuing in this line of analysis, Table 2 provides important information regarding the descriptive analysis in terms of educational evolution in the different regions, detailing how such evolution has been taking into account the different academic levels. The total range for the joint analysis of the regions is very broad, ranging from 3 to 13 years of dedication to education.

For the vast majority of cases, on average, this record tends to exceed at least 3 years of education, which indicates, for the vast majority of the countries, the primary cycle, or basic education, remains the norm. In particular, the regions of Latin America and Asia and the Pacific Zone far exceed this average, standing at around 5 years of maximum registration. The maximum records experienced by the countries of the African region show 8 years of schooling, 10 years for the case of the Middle East, and 9 and 13 years

Table 1 Descriptive statistics by years of schooling

		Ascendants			Descendants		
Latin America		Min	Med	Max	Min	Med	Max
Argentina	1870–2010	0.28	3.86	9.00	0.83	5.34	9.80
Bolivia	1870–2010	0.05	2.11	8.00	0.14	4.01	10.13
Brazil	1870–2010	0.1	1.85	6.04	0.33	2.89	8.92
Chile	1870–2010	0.32	3.96	9.16	0.78	5.36	10.40
Colombia	1870–2010	0.26	2.39	6.81	0.56	3.76	10.38
Ecuador	1870–2010	0.13	2.58	7.13	0.45	3.83	8.30
Guatemala	1870–2010	0.17	1.38	4.04	0.44	2.25	6.26
Mexico	1870–2010	0.28	2.36	7.53	0.77	3.7	10.06
Nicaragua	1870–2010	0.12	1.83	5.38	0.36	2.68	7.78
Panama	1870–2010	0.06	3.17	9.11	0.2	4.56	9.79
Paraguay	1870–2010	0.05	2.49	6.32	0.17	3.71	9.21
Peru	1870–2010	0.01	2.47	8.61	0.09	4.13	10.35
Dominican Rep.	1870–2010	0.03	2.20	6.71	0.24	3.51	8.65
Uruguay	1870–2010	0.24	3.37	8.31	0.72	4.89	8.51
Venezuela	1870–2010	0.01	1.88	6.68	0.03	3.00	9.09
Asia and Pacific							
Bangladesh	1870–2010	0.01	0.96	3.82	0.03	1.88	8.39
Cambodia	1870–2010	0.01	0.74	3.41	0.01	1.61	5.98
China	1870–2010	0.01	1.67	7.52	0.01	3.74	9.54
Honk Kong	1870–2010	0.01	3.27	9.98	0.07	5.94	13.72
India	1870–2010	0.02	1.04	4.6	0.07	2.19	8.51
Indonesia	1870–2010	0.02	1.20	5.07	0.02	2.64	8.86
Philippine Isl	1870–2010	0.02	2.28	7.66	0.08	3.80	9.10
Malaysia	1870–2010	0.00	2.19	8.64	0.04	4.22	12.38
Nepal	1870–2010	0.00	0.39	2.55	0.01	1.17	6.11
Pakistan	1870–2010	0.01	0.89	3.47	0.01	1.84	6.35
Rep. Korea	1870–2010	0.01	3.58	11.52	0.01	5.70	13.17
Taiwan	1870–2010	0.01	2.52	9.88	0.00	4.70	12.99
Thailand	1870–2010	0.00	1.39	5.29	0.01	3.25	10.48
Middle East							
Iran	1870–2010	0.01	1.10	6.64	0.01	2.87	10.55
Iraq	1870–2010	0.01	0.80	5.48	0.01	2.17	8.54
Jordan	1870–2010	0.01	1.61	8.18	0.01	3.77	10.47
Kuwait	1870–2010	0.01	1.64	6.14	0.01	2.66	7.30
Syria	1870–2010	0.01	1.11	4.88	0.01	2.24	77.77
Yemen	1870–2010	0.00	0.10	1.30	0.01	0.85	5.38
Africa							
Algeria	1870–2010	0.08	1.17	5.35	0.25	2.50	8.24
Cameroon	1870–2010	0.01	1.00	5.27	0.02	2.22	6.57
Ivory Coast	1870–2010	0.01	0.64	3.48	0.01	1.74	5.48
Egypt	1870–2010	0.01	0.96	5.09	0.05	2.31	8.73
Gambia	1870–2010	0.04	0.44	2.10	0.12	1.28	5.70
Ghana	1870–2010	0.01	1.35	6.65	0.03	2.82	8.38
Kenya	1870–2010	0.01	1.22	5.66	0.02	2.51	6.84
Libya	1870–2010	0.01	1.01	5.97	0.01	2.56	9.98
Mali	1870–2010	0.01	0.19	1.10	0.01	0.57	2.88
Morrocco	1870–2010	0.01	0.59	3.62	0.01	1.54	6.87
Mozambique	1870–2010	0.01	0.34	0.98	0.01	0.84	3.08
Nigeria	1870–2010	0.01	0.27	1.16	0.01	0.60	2.59

Table 1 (continued)

Latin America		Ascendants			Descendants		
		Min	Med	Max	Min	Med	Max
Dem. Rep. Congo	1870–2010	0.01	0.64	3.52	0.01	1.58	4.78
Senegal	1870–2010	0.01	1.02	2.32	0.01	1.47	3.87
Sierra Leone	1870–2010	0.02	0.51	2.44	0.05	1.28	6.11
South Africa	1870–2010	0.52	3.18	8.23	0.92	4.47	10.23
Uganda	1870–2010	0.01	0.90	4.14	0.01	1.84	6.11
Zambia	1870–2010	0.01	1.58	6.20	0.01	2.73	8.07
Zimbabwe	1870–2010	0.01	1.45	6.17	0.01	3.04	8.74

Own elaboration from the "Barro & Lee educational attainment dataset"

for the cases of Latin America and Asia and the Pacific Area, respectively.

However, the main problem arising from the data is the minimum years of education in the different regions, where the percentages of improvement of one generation with respect to another are not so favorable. This pattern of behavior shows in Fig. 1 positive trends for all developing areas, which continues to be marked by a clear indication of stagnation in development in these countries.

One symptom of this behavior is reflected in the graphic instruments used to delineate the years of education attained between one generation and another. This evolution is marked by a lack of mobility within countries that is especially marked by a population nucleus clearly stagnating around very close values. Thus, the data point closer to the lower tail of the distribution than to the maximum records, which implies direct transmission, and not a way out of the stagnation characteristic of these regions.

Empirical Results

Intergenerational Educational Correlation

With respect to the calculation of the Pearson Spearman index, the method proposed comprises an analysis of the total number of countries that make up the different regions, differentiated by gender, which allows conclusions to be drawn that have so far been scarcely developed by the reference literature. It is important that, since this is a standardised measure of estimation, one would expect considerably high indices—with ρ values above 0.85—as a sign of high correlation between the academic performance shown by one generation and the next. This is a response to a particularly common dynamic, exhibited in the majority of these still-developing economies, indicative of a marked tendency towards the lack of intergenerational educational mobility characteristic of these areas.

Table 3 shows the results obtained. As can be seen, the results in no case fall below a correlation index of 0.70, and the majority of cases exceed values higher than $\rho = 0.90$. Especially noteworthy are those cases in which the existing correlation between individuals of the same gender exceeds values higher than $\rho = 0.95$, thus showing a high degree of intergenerational correlation.

The analysis by gender raises the possibility of establishing the general result that in all developing sample areas the number of countries which shows higher levels of the coefficient for the pair mother-daughter is higher with respect to the number of countries which exhibits higher coefficients for the pair father-son, in this way indicating the general low intergenerational mobility for the case of females in all developing areas. This result is consistent with the previous literature.

In the case of the Latin American countries, 10 of 15 nations show correlation coefficients higher for the female pair, with similar numbers, 4 of 6, in the case of Middle East. This analysis by gender is significant since this differential by gender registers coefficients of different power when referring to the degree of correlation between education level of the mother and the education level of the father, as occurs, for example, in countries such as Iran, Iraq, Syria, and Yemen, where the level of correlation between mother and daughter is 0.9340, 0.8842, 0.9158, and 0.9421, respectively, while the level of correlation between father and son is 0.9236, 0.8540, 0.8820, and 0.7507, showing a clear bias in favor of the intergenerational mobility of the father.

In the case of Asia and Pacific, and of the Africa, the results are more balanced, although with a greater number of countries in both cases showing lower intergenerational mobility for women, 10 out of 18 in Africa, and 7 out of 13 in the Asia and Pacific region. In the case of Africa, there seems to be a differential bias in favor of the education level of the father with respect to the son, such as in Monzanbique, Zambia and South Africa, with indices of 0.7558, 0.8714 and 0.9298, respectively, compared to the degree of the mobility of the mother with respect to the daughter, which are 0.9358, 0.9697 and 0.9681. However, there are also cases where the intergenerational mobility of

Table 2 Descriptive statistics by academic level

		Ascendants			Descendants		
Latin America		Primary	Secondary	Tertiary	Primary	Secondary	Tertiary
Argentina	1870–2010	3.20	0.56	0.10	4.21	1.06	0.07
Bolivia	1870–2010	1.43	0.59	0.10	2.85	1.07	0.09
Brazil	1870–2010	1.37	0.41	0.06	2.30	0.55	0.03
Chile	1870–2010	2.84	1.00	0.13	3.78	1.47	0.11
Colombia	1870–2010	1.76	0.56	0.08	2.55	1.11	0.10
Ecuador	1870–2010	1.99	0.49	0.10	2.86	0.90	0.07
Guatemala	1870–2010	1.15	0.20	0.03	1.89	0.35	0.01
Mexico	1870–2010	1.73	0.54	0.09	2.59	1.04	0.08
Nicaragua	1870–2010	1.42	0.32	0.10	2.01	0.57	0.12
Panama	1870–2010	2.30	0.74	0.13	3.22	1.23	0.10
Paraguay	1870–2010	2.03	0.41	0.06	2.93	0.75	0.03
Peru	1870–2010	1.61	0.69	0.16	2.69	1.25	0.20
Dominican. Rep	1870–2010	1.73	0.41	0.05	2.65	0.79	0.07
Uruguay	1870–2010	2.61	0.65	0.10	3.66	1.16	0.06
Venezuela	1870–2010	1.31	0.49	0.08	2.12	0.82	0.06
Asia and Pacific							
Bangladesh	1870–2010	0.67	0.24	0.02	1.18	0.68	0.02
Camboya	1870–2010	0.67	0.11	0.00	1.33	0.28	0.01
China	1870–2010	1.23	0.40	0.02	2.54	1.13	0.04
Honk Kong	1870–2010	2.04	1.10	0.13	3.27	2.48	0.17
India	1870–2010	0.72	0.27	0.04	1.49	0.66	0.04
Indonesia	1870–2010	0.98	0.21	0.01	2.12	0.50	0.01
Philippine Islands	1870–2010	1.44	0.66	0.18	2.57	1.05	0.18
Malaysia	1870–2010	1.49	0.60	0.05	2.57	1.53	0.10
Nepal	1870–2010	0.23	0.14	0.02	0.77	0.37	0.02
Pakistan	1870–2010	0.77	0.50	0.06	1.06	0.71	0.04
Rep. Korea	1870–2010	2.54	0.88	0.15	3.57	1.93	0.19
Taiwan	1870–2010	1.53	0.84	0.12	2.62	1.88	0.20
Thailand	1870–2010	1.14	0.21	0.04	2.41	0.76	0.08
Middle East							
Iran	1870–2010	0.67	0.37	0.05	1.61	1.18	0.09
Iraq	1870–2010	0.49	0.25	0.05	1.42	0.66	0.09
Jordan	1870–2010	0.98	0.54	0.08	2.37	1.29	0.07
Kuwait	1870–2010	0.66	0.80	0.10	1.37	1.19	0.05
Syria	1870–2010	0.82	0.25	0.04	1.76	0.44	0.03
Yemen	1870–2010	0.07	0.03	0.00	0.59	0.23	0.01
Africa							
Algeria	1870–2010	0.87	0.27	0.03	1.73	0.71	0.05
Camerún	1870–2010	0.79	0.20	0.01	1.64	0.56	0.01
Ivory Coast	1870–2010	0.44	0.17	0.02	1.25	0.45	0.02
Egypt	1870–2010	0.59	0.32	0.05	1.42	0.81	0.06
Gambia	1870–2010	0.29	0.14	0.01	0.82	0.45	0.01
Ghana	1870–2010	0.85	0.48	0.02	1.78	1.02	0.02
Kenya	1870–2010	1.02	0.19	0.02	2.12	0.37	0.03
Libya	1870–2010	0.71	0.25	0.02	1.75	0.70	0.11
Mali	1870–2010	0.15	0.03	0.00	0.47	0.10	0.01
Morrocco	1870–2010	0.34	0.22	0.03	0.89	0.58	0.06
Mozambique	1870–2010	0.33	0.02	0.00	0.77	0.07	0.00
Nigeria	1870–2010	0.24	0.03	0.00	0.47	0.11	0.01

Table 2 (continued)

Latin America		Ascendants			Descendants		
		Primary	Secondary	Tertiary	Primary	Secondary	Tertiary
Dem. Rep. Congo	1870–2010	0.54	0.12	0.01	1.25	0.32	0.01
Senegal	1870–2010	0.93	0.11	0.01	1.24	0.23	0.01
Sierra Leone	1870–2010	0.37	0.14	0.01	0.89	0.38	0.01
South Africa	1870–2010	2.49	0.61	0.05	3.51	0.92	0.03
Uganda	1870–2010	0.81	0.09	0.01	1.62	0.22	0.01
Zambia	1870–2010	1.41	0.16	0.01	2.43	0.30	0.00
Zimbabwe	1870–2010	1.06	0.35	0.04	2.27	0.75	0.02

Own elaboration from the "Barro & Lee educational attainment dataset"

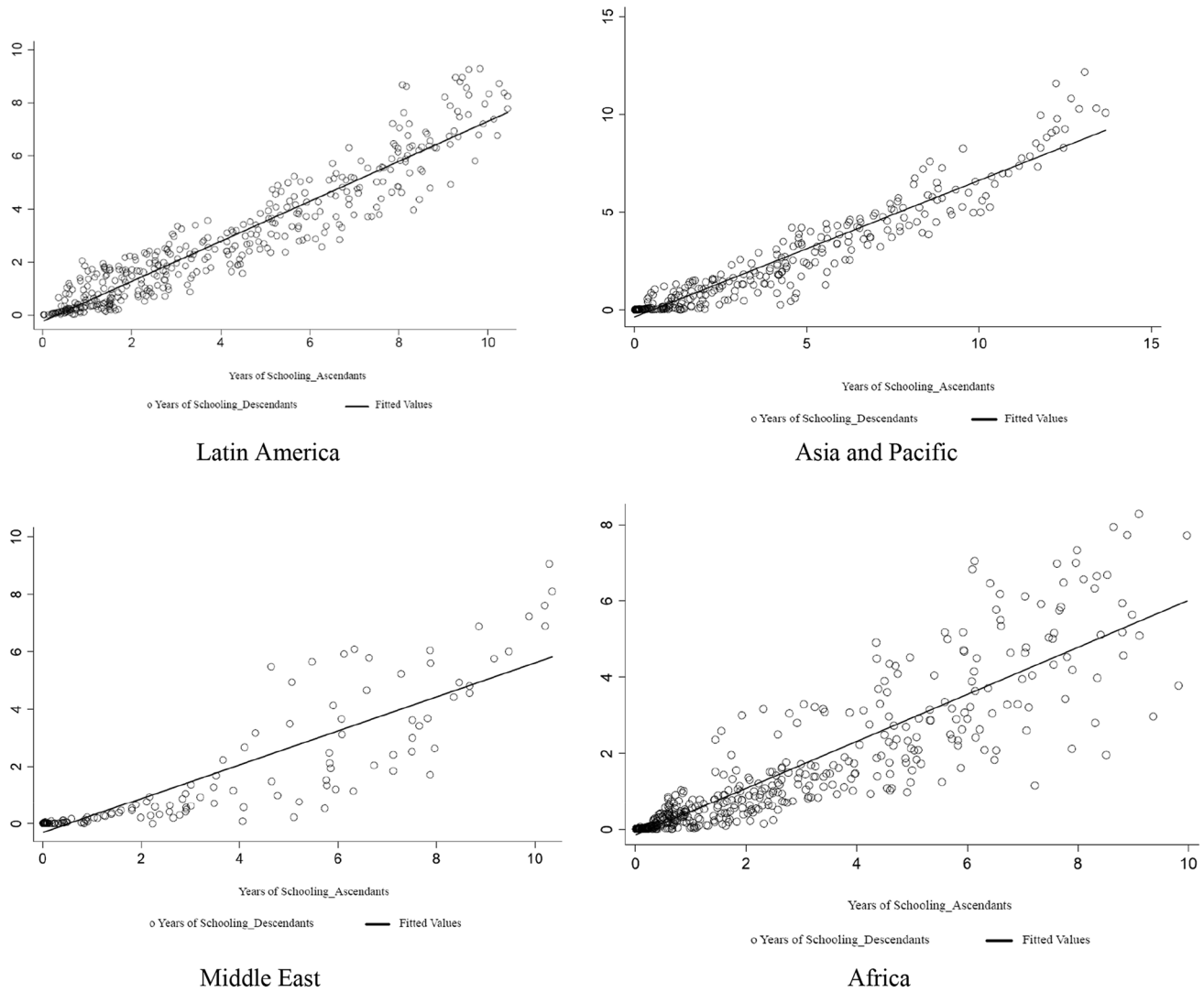

Fig. 1 Years of schooling father vs. years of schooling child

Table 3 Pearson spearman full set of estimates

Latin America					
Argentina	Educational Attainment (D-M)	Educational Attainment (D-F)	Mexico	Educational Attainment (D-M)	Educational Attainment (D-F)
Educational Attainment (A-M)	0.9831*	0.9873*	Educational Attainment (A-M)	0.9311*	0.9604*
Educational Attainment (A-F)	0.9722*	0.9776*	Educational Attainment (A-F)	0.9360*	0.9587*
Bolivia	Educational Attainment (D-M)	Educational Attainment (D-F)	Nicaragua	Educational Attainment (D-M)	Educational Attainment (D-F)
Educational Attainment (A-M)	0.9509*	0.9763*	Educational Attainment (A-M)	0.9208*	0.9604*
Educational Attainment (A-F)	0.9014*	0.9416*	Educational Attainment (A-F)	0.8277*	0.9267*
Brazil	Educational Attainment (D-M)	Educational Attainment (D-F)	Panama	Educational Attainment (D-M)	Educational Attainment (D-F)
Educational Attainment (A-M)	0.9207*	0.9332*	Educational Attainment (A-M)	0.9756*	0.9790*
Educational Attainment (A-F)	0.9502*	0.9556*	Educational Attainment (A-F)	0.9743*	0.9774*
Chile	Educational Attainment (D-M)	Educational Attainment (D-F)	Paraguay	Educational Attainment (D-M)	Educational Attainment (D-F)
Educational Attainment (A-M)	0.9583*	0.9813*	Educational Attainment (A-M)	0.9596*	0.9790*
Educational Attainment (A-F)	0.9538*	0.9824*	Educational Attainment (A-F)	0.9631*	0.9784*
Colombia	Educational Attainment (D-M)	Educational Attainment (D-F)	Peru	Educational Attainment (D-M)	Educational Attainment (D-F)
Educational Attainment (A-M)	0.9808*	0.9830*	Educational Attainment (A-M)	0.9715*	0.9795*
Educational Attainment (A-F)	0.9791*	0.9524*	Educational Attainment (A-F)	0.9429*	0.9625*
Dominican. Rep	Educational Attainment (D-M)	Educational Attainment (D-F)	Uruguay	Educational Attainment (D-M)	Educational Attainment (D-F)
Educational Attainment (A-M)	0.9430*	0.9705*	Educational Attainment (A-M)	0.9433*	0.9795*
Educational Attainment (A-F)	0.9274*	0.9597*	Educational Attainment (A-F)	0.9648*	0.9754*
Ecuador	Educational Attainment (D-M)	Educational Attainment (D-F)	Venezuela	Educational Attainment (D-M)	Educational Attainment (D-F)
Educational Attainment (A-M)	0.9442*	0.9705*	Educational Attainment (A-M)	0.9405*	0.9501*
Educational Attainment (A-F)	0.9424*	0.9589*	Educational Attainment (A-F)	0.9102*	0.9271*
Guatemala	Educational Attainment (D-M)	Educational Attainment (D-F)			
Educational Attainment (A-M)	0.9099*	0.9007*			

Table 3 (continued)

Educational Attainment (A-F)	0.9360*	0.9587*			
Asia and Pacifc					
Bangladesh	Educational Attainment (D-M)	Educational Attainment (D-F)	Nepal	Educational Attainment (D-M)	Educational Attainment (D-F)
Educational Attainment (A-M)	0.9533*	0.9066*	Educational Attainment (A-M)	0.9063*	0.9785*
Educational Attainment (A-F)	0.9175*	0.9853*	Educational Attainment (A-F)	0.8050*	0.9643*
Cambodia	Educational Attainment (D-M)	Educational Attainment (D-F)	Pakistan	Educational Attainment (D-M)	Educational Attainment (D-F)
Educational Attainment (A-M)	0.9065*	0.9663*	Educational Attainment (A-M)	0.9841*	0.9786*
Educational Attainment (A-F)	0.8177*	0.9374*	Educational Attainment (A-F)	0.9212*	0.9899*
China	Educational Attainment (D-M)	Educational Attainment (D-F)	Philippine Islands	Educational Attainment (D-M)	Educational Attainment (D-F)
Educational Attainment (A-M)	0.8928*	0.9213*	Educational Attainment (A-M)	0.9626*	0.9867*
Educational Attainment (A-F)	0.8081*	0.9841*	Educational Attainment (A-F)	0.9336*	0.9654*
Hong Kong	Educational Attainment (D-M)	Educational Attainment (D-F)	Republic of Korea	Educational Attainment (D-M)	Educational Attainment (D-F)
Educational Attainment (A-M)	0.9850*	0.9834*	Educational Attainment (A-M)	0.9712*	0.9756*
Educational Attainment (A-F)	0.8924*	0.9321*	Educational Attainment (A-F)	0.9138*	0.9654*
India	Educational Attainment (D-M)	Educational Attainment (D-F)	Taiwan	Educational Attainment (D-M)	Educational Attainment (D-F)
Educational Attainment (A-M)	0.9687*	0.9798*	Educational Attainment (A-M)	0.9694*	0.9492*
Educational Attainment (A-F)	0.9641*	0.9958*	Educational Attainment (A-F)	0.8803*	0.9052*
Indonesia	Educational Attainment (D-M)	Educational Attainment (D-F)	Thailand	Educational Attainment (D-M)	Educational Attainment (D-F)
Educational Attainment (A-M)	0.9719*	0.98,575*	Educational Attainment (A-M)	0.9745*	0.9824*
Educational Attainment (A-F)	0.9102*	0.9608*	Educational Attainment (A-F)	0.9493*	0.9666*
Malaysia	Educational Attainment (D-M)	Educational Attainment (D-F)			
Educational Attainment (A-M)	0.9831*	0.9773*			
Educational Attainment (A-F)	0.8774*	0.9342*			
Middle East					
Iran	Educational Attainment (D-M)	Educational Attainment (D-F)	Kuwait	Educational Attainment (D-M)	Educational Attainment (D-F)

Table 3 (continued)

Educational Attainment (A-M)	0.9236*	0.9799*	Educational Attainment (A-M)	0.9342*	0.9811*
Educational Attainment (A-F)	0.8524*	0.9340*	Educational Attainment (A-F)	0.8470*	0.9243*
Iraq	Educational Attainment (D-M)	Educational Attainment (D-F)	Syria	Educational Attainment (D-M)	Educational Attainment (D-F)
Educational Attainment (A-M)	0.8540*	0.9643*	Educational Attainment (A-M)	0.8820*	0.9689*
Educational Attainment (A-F)	0.7646*	0.8842*	Educational Attainment (A-F)	0.7569*	0.9158*
Jordania	Educational Attainment (D-M)	Educational Attainment (D-F)	Yemen	Educational Attainment (D-M)	Educational Attainment (D-F)
Educational Attainment (A-M)	0.9149*	0.9815*	Educational Attainment (A-M)	0.7507*	0.9587*
Educational Attainment (A-F)	0.7750*	0.8817*	Educational Attainment (A-F)	0.7149*	0.9421*
Africa					
Argelia	Educational Attainment (D-M)	Educational Attainment (D-F)	Mali	Educational Attainment (D-M)	Educational Attainment (D-F)
Educational Attainment (A-M)	0.8208*	0.9506*	Educational Attainment (A-M)	0.9543*	0.9632*
Educational Attainment (A-F)	0.6542*	0.8316*	Educational Attainment (A-F)	0.9042*	0.9073*
Egypt	Educational Attainment (D-M)	Educational Attainment (D-F)	Mozambique	Educational Attainment (D-M)	Educational Attainment (D-F)
Educational Attainment (A-M)	0.9584*	0.9856*	Educational Attainment (A-M)	0.7558*	0.8215*
Educational Attainment (A-F)	0.8866*	0.9478*	Educational Attainment (A-F)	0.9062*	0.9358*
Morrocco	Educational Attainment (D-M)	Educational Attainment (D-F)	Nigeria	Educational Attainment (D-M)	Educational Attainment (D-F)
Educational Attainment (A-M)	0.9406*	0.9877*	Educational Attainment (A-M)	0.9300*	0.8862*
Educational Attainment (A-F)	0.8929*	0.9660*	Educational Attainment (A-F)	0.8618*	0.9479*
Cameroon	Educational Attainment (D-M)	Educational Attainment (D-F)	Senegal	Educational Attainment (D-M)	Educational Attainment (D-F)
Educational Attainment (A-M)	0.9132*	0.9586*	Educational Attainment (A-M)	0.8816*	0.8690*
Educational Attainment (A-F)	0.7265*	0.8580*	Educational Attainment (A-F)	0.8737*	0.8810*
Rep. Dem. Congo	Educational Attainment (D-M)	Educational Attainment (D-F)	Sierra Leone	Educational Attainment (D-M)	Educational Attainment (D-F)

Table 3 (continued)

Educational Attainment (A-M)	0.8067*	0.9104*	Educational Attainment (A-M)	0.9619*	0.9782*
Educational Attainment (A-F)	0.5979*	0.7591*	Educational Attainment (A-F)	0.9360*	0.9624*
Ivory Coast	Educational Attainment (D-M)	Educational Attainment (D-F)	South Africa	Educational Attainment (D-M)	Educational Attainment (D-F)
Educational Attainment (A-M)	0.8986*	0.9764*	Educational Attainment (A-M)	0.8714*	0.9586*
Educational Attainment (A-F)	0.7298*	0.8587*	Educational Attainment (A-F)	0.8812*	0.9697*
Gambia	Educational Attainment (D-M)	Educational Attainment (D-F)	Uganda	Educational Attainment (D-M)	Educational Attainment (D-F)
Educational Attainment (A-M)	0.9510*	0.9916*	Educational Attainment (A-M)	0.9567*	0.9820*
Educational Attainment (A-F)	0.9320*	0.9796*	Educational Attainment (A-F)	0.9619*	0.9521*
Ghana	Educational Attainment (D-M)	Educational Attainment (D-F)	Zambia	Educational Attainment (D-M)	Educational Attainment (D-F)
Educational Attainment (A-M)	0.8287*	0.8984*	Educational Attainment (A-M)	0.9298*	0.9823*
Educational Attainment (A-F)	0.7216*	0.8292*	Educational Attainment (A-F)	0.9042*	0.9681*
Kenya	Educational Attainment (D-M)	Educational Attainment (D-F)	Zimbabwe	Educational Attainment (D-M)	Educational Attainment (D-F)
Educational Attainment (A-M)	0.9054*	0.9597*	Educational Attainment (A-M)	0.9489*	0.9788*
Educational Attainment (A-F)	0.7760*	0.8753*	Educational Attainment (A-F)	0.9241*	0.9616*

Own elaboration from the "Barro & Lee educational attainment dataset"

A-M ascendant-male, *A-M* ascendant-female, *D-M* descendant-male, *D-M* descendant-female

*Significance coefficient at 95%

**Significance coefficient at 99%

the mother is lower than that of the father, as an in Cameroon or in Congo.

Ordered Probit

Table 4 shows the ordered probit results for each of the regions in the sample, broken down by the probability of reaching a certain level of education by the children, relative to their parents, which will allow greater accuracy in explaining the behavior, in terms of academic performance, characteristic of these regions. The dependent variable represents the different levels of education achieved by the children, while the independent one is the performance achieved by the parents in the same categories.

For the case of Latin America, it can be seen that the probability of an individual reaching the primary level, when the parent only reached that same level, is 15.52%, while the probability of another, whose parent managed to complete a higher level, such as tertiary education or higher training, rises by almost 10 points, to 23%. Exactly

the same occurs for the other levels, in that the influence of better-educated parents has a direct and positive impact on the educational attainments of their children.

It is clear that the secondary is the level that has the greatest influence. Of the three proposed levels, there is a greater probability of reaching each one of them, when the parent has managed to complete the secondary cycle, with the probabilities there being 14.95, 47.17, and 75%, respectively.

Only basic education by the parents does not guarantee that the children will surpass them. The analysis for the region of the Asia and Pacific Zone clearly shows that parental educational attainment at the tertiary level subsequently determines the most representative impact on the educational performance experienced by the children.

Probability of success ranges from 36.45% in the case of primary education, through 38.52% in the case of secondary education, and ending at a probability of 84.51% at the tertiary level. These numbers are in line with the improvement in educational transition within these societies. The highest percentages within each of the levels correspond to what would be the direct transmission of the educational achievement at that level, with a degree of correspondence that ranges from 26.76%, 20.33%, and 84 0.51%, respectively.

Table 4 Ordered probit regression of the academic level attainment

Academic level attainment descendants			
Academic level attainment ascendants			
Latin America	Primary level	Secondary level	Tertiary level
Primary level	0.1552 (11.75)*	0.0219 (1.96)*	0.0612 (4.58)
Secondary level	0.1495 (2.55)*	0.4717 (8.76)*	0.1775 (3.73)
Tertiary level	0.2300 (0.72)*	0.2216 (0.90)*	0.0501 (0.28)
Asia and Pacific Zone	Primary level	Secondary level	Tertiary level
Primary level	0.2676 (13.67)	0.0319 (2.93)*	0.0409 (4.13)*
Secondary level	0.1696 (2.00)*	0.2033 (3.26)*	0.0503 (1.45)
Tertiary level	0.3645 (0.65)	0.3852 (3.15)*	0.8451 (4.25)*
Middle East	Primary level	Secondary level	Tertiary level
Primary level	0.3102 (2.86)*	0.1438 (1.49)	0.2204 (6.70)*
Secondary level	0.4969 (1.32)	0.0895 (3.39)	0.0424 (0.42)
Tertiary level	0.8415 (1.38)	0.2740 (1.14)	0.0867 (0.11)
Africa	Primary level	Secondary level	Tertiary level
Primary level	0.2776 (14.08)*	0.0732 (5.62)*	0.0431 (3.75)
Secondary level	0.5642 (3.80)*	0.9369 (7.95)*	0.0418 (1.19)
Tertiary level	0.1650 (0.17)*	0.4762 (0.61)	0.7277 (5.55)*

*Significance coefficient at 95% **Significance coefficient at 99%

Own elaboration from the "Barro & Lee Educational Attainment Dataset"

In contrast, the results obtained for the regions of Africa and the Middle East show that it is primary level education that provides the greatest probability of subsequent success. In Middle Eastern countries, parents with a basic education transmit that level to their children 31% of the time, those with secondary education transmit at a rate of 49%, and those who completed a tertiary level transmit to their children at a rate of 84%. The same is the case with the countries in the African region, where it is clear that the completion of only basic education by the parents is no guarantee at all that their children will move on to higher levels.

OLS Methodology

Figure 2 shows the results obtained for the coefficients of the estimation of educational intergenerational mobility according to the ordinary least squares (OLS) methodology, which is intended to quantify the degree of mobility between generations. For each of the economies studied in the analysis, mobility coefficients have been obtained that are rarely below 0.70, with the lowest observed being 0.6. This macro regional analysis points to clear symptoms of stagnation in the sample countries, which greatly limits their economic growth.

The particular analysis of each region contains the following conclusions. In the case of the Latin American region, coefficients greater than 0.6 can be seen, reaching a maximum of 0.8713, in the case of Mexico. This is characteristic of underdeveloped regions, where educational transmission is practically direct from one generation to another, thus limiting the patterns of evolution and development, and leaving growth stagnant. Latin America as a whole has an average result of 0.7123, with the highest scores in Mexico (0.8713), Colombia (0.8623), Brazil (0.8175), and Bolivia (0. 8442), while those with lower scores have values between 0.65 and 0.70, including Peru (0.6709), the Dominican Republic (0.6785), Paraguay (0.7004), and Panama (0.7177). In short, the region presents a high degree of dependency between generations.

The Asia and Pacific region has seen significant expansion and economic growth in recent decades. Economies such as Hong Kong, Malaysia, Taiwan, and the Republic of Korea have experienced evolutions in terms of years of study of more than 6 years on average, and from one generation to another, a result of great effort carried out by these countries in terms of integration and economic growth.

The average education in these countries has gone from values of around 3.23 years of education in the first 50 years of the sample, to more than 10 years of education in the last three decades This puts the average for the region at 0.8068, which, although it provides a high level of intergenerational immobility, is interesting in terms of divergence

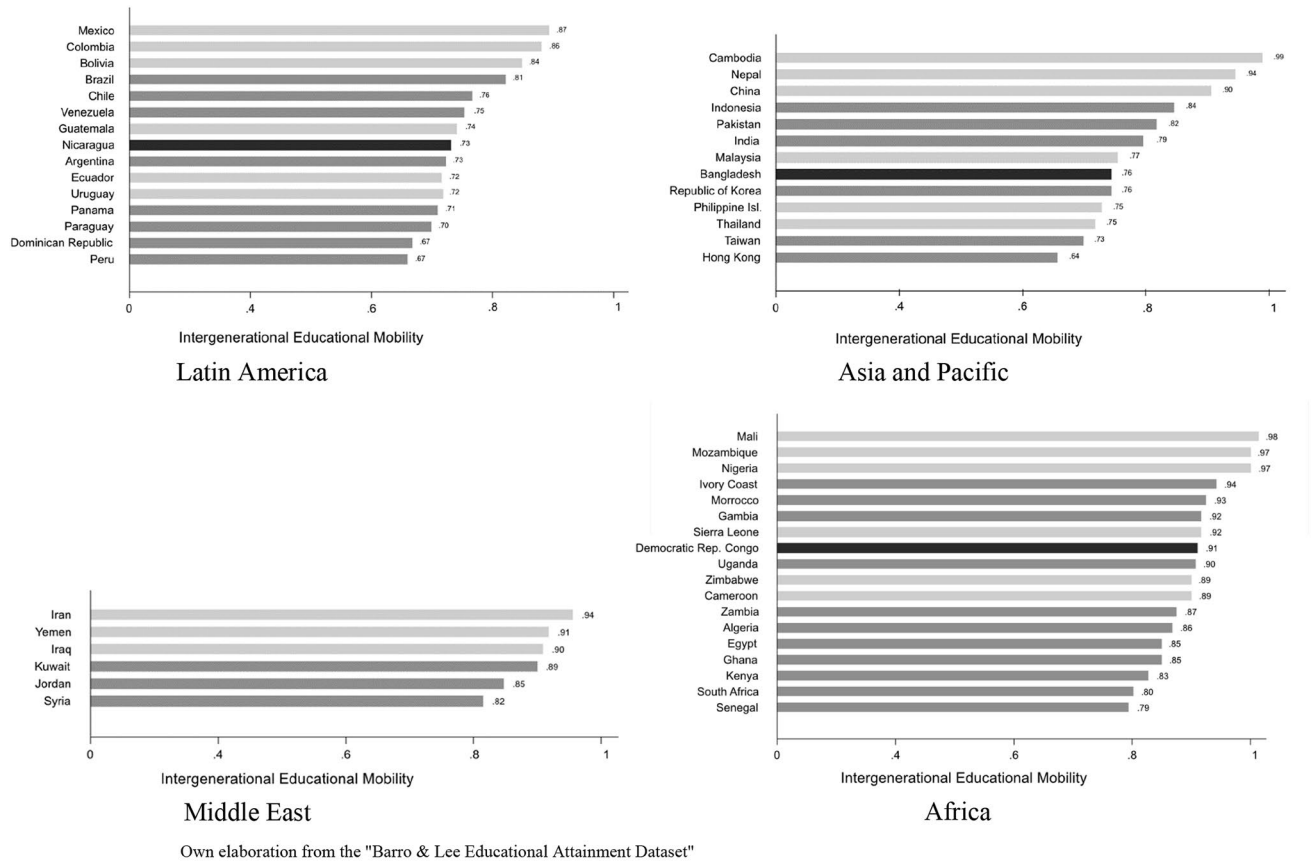

Fig. 2 OLS Intergenerational educational mobility ranking

between regions. The countries with the highest scores are Cambodia (0.9935), China (0.9075), Indonesia (0.8481), and Pakistan (0.8239). Those with lower scores, representing a greater degree of independence of the generations, thus responding to the development pattern most characteristic of advanced economies and developed countries, are Hong Kong (0.6475), Taiwan (0.7322), Republic of Korea (0.7620), and Malaysia (0.7747).

The Middle East is the area that presents the highest coefficients in terms of educational intergenerational mobility. The majority of countries present values above 0.85, which is indicative of a high degree of immobility between generations and an impediment to economic development.

Especially high rates are seen in countries such as Iran (0.9474), Iraq (0.9063), Yemen (0.9152), and Kuwait (0.8994), with the lowest value of the group being Syria (0.8270). An explanation of these results highlights the scarcity of opportunity within these countries, marked by very large divergences on the social scale that lead to a dearth of efficient strategies to promote economic growth and allow the development of consistent welfare states that guarantee rights and conditions that allow progress.

The average weighting of the intergenerational mobility coefficient places a value of 0.92 for the African region, showing a high degree of intergenerational educational dependence, with the most common level of attainment being primary education.

Typical of the region, South Africa, Senegal, and Egypt exhibit values of 0.8064, 0.7990, and 0.8595, respectively. Studies by Alan-Desiré and Vencatachellum (2007) for the case of South Africa have emphasized a very precarious level of development in educational matters.

Figure 3 presents information regarding the evolution of the years dedicated to education by each of the generations in the sample. As can be seen, the regions of the Middle East and Africa present the worst balance in terms of mobility, with more intergenerational similarities than with the two remaining regions of Latin America and Asia and the Pacific Zone, although the latter two do, in fact, present more favorable coefficients. In any case, it can also be seen that the lower limit of each of the boxes corresponding to the children has a value close to 4 years, in comparison to the lower limit of the boxes corresponding to the parents, which stands at 2 years. This is a clearly positive trend.

In the Latin American region, the bulk of the population of parents have between 2 and 5 years of study, while the representative distribution of the children shows that 75% of the sample have a maximum value of 6 years of study. This difference is, although slight, somewhat significant. In the case of the Asian region, this difference is more obvious, since 75% of the sample of children have twice the years of education achieved by the generation of their parents. In the case of the Middle East, the bulk of the population of parents fall somewhere between 0 and 4 years of study, while the representative part of the generation of their children attains a maximum value of 5 years of study.

For Asia and the Middle East, the divergence is less evident, with at least half of the cases with less than 4 years of study. An equally striking result is that almost a quarter of children fail to reach the same level as their parents. This key result can be broadly extended to every one of the regions analysed. Of course, each region has its own peculiarities and characteristics, stemming from such external factors as different economic structures, and different social and cultural conditions affecting development.

Conclusions

This work presents empirical evidence of the measurement of intergenerational education in developing regions of the world, with the aim of measuring the degree of transmission of educational attainment from one generation to the next. A set of 52 countries from Latin America, Asia and the Pacific, the Middle East, and Africa is examined over time, with data from 1870 to 2010. An empirical analysis is carried out to consider the correlation between the levels of schooling of the different generations, followed by calculations of the probability of reaching a given level of educational

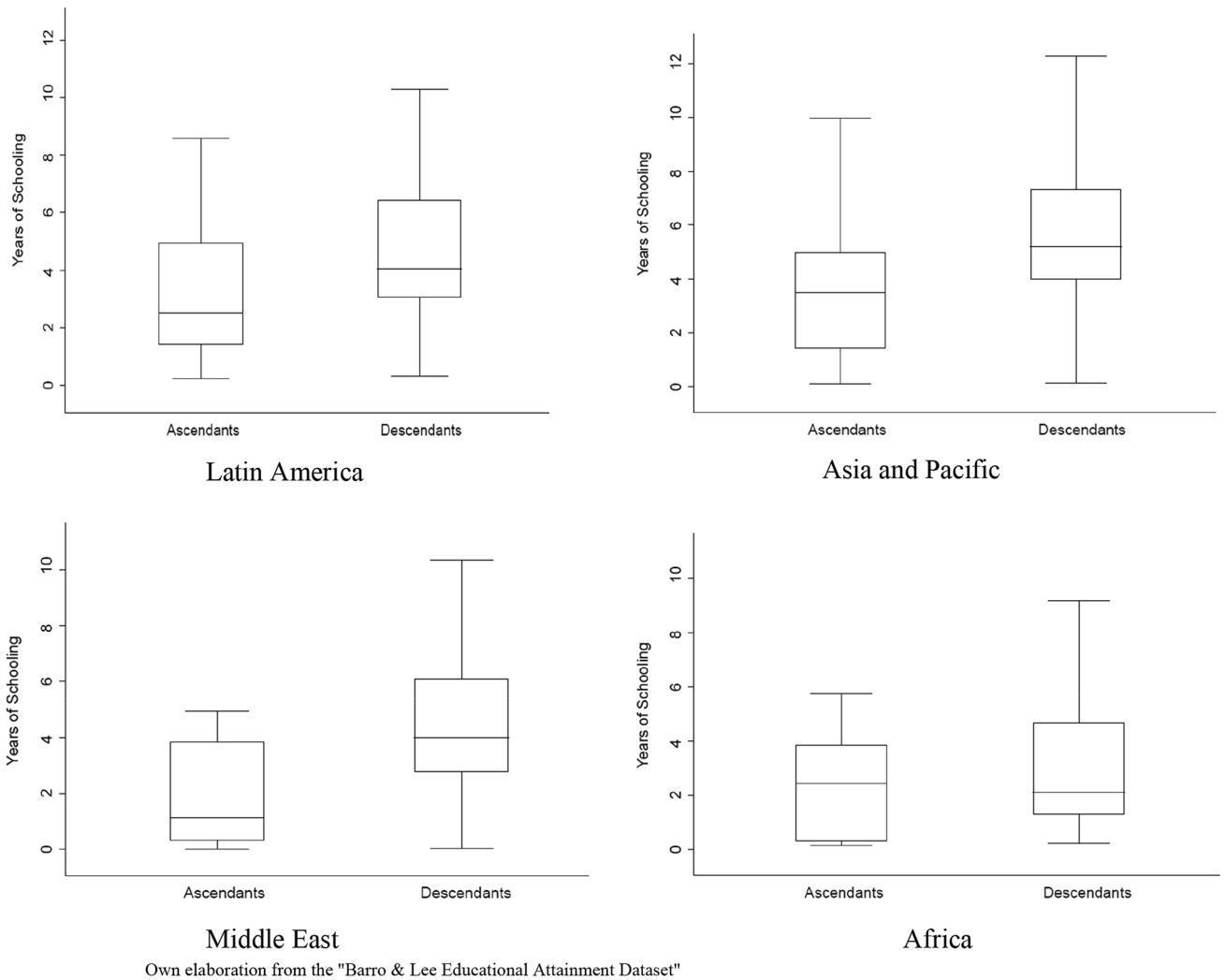

Fig. 3 Box plot intergenerational educational mobility ranking

attainment, using a probit model and the estimation of a linear regression.

The estimated magnitude of intergenerational mobility of the sample countries leaves few encouraging results in terms of education and, consequently, economic development, within the time horizon considered. The quantification of this transmission uses the Pearson-Spearman indices, with these usually being higher than $\rho = 0.90$, with especially noteworthy being those cases in which the existing correlation between individuals of the same gender exceeds values higher than $\rho = 0.95$, with the analysis by gender raising, according to the literature, the general low intergenerational mobility for the case of females in all developing areas.

The OLS estimations also show intergenerational indices higher, between 0.67 and 0.99, with Asia and Pacific being the region with the highest values, and Latin America being the developing area with the lowest indices. These high levels of transmission between generations in the developing world greatly limit the patterns of evolution and development, leaving global growth stagnant. The probit methodology shows a high probability of children remaining at the educational level reached by their parents, and a very low trend towards increasing the margin in terms of higher educational levels.

Thus, our results are consistent with the recent literature classified by region, Africa (Razzu & Wambile, 2022), Latin America (Neidhöfer et al., 2021) and Asia (Emran & Shilpi, 2015; Magnani & Zhu, 2015). All this evidence for developing countries raise concerns regarding economic inequality, since high intergenerational persistence of education, particularly for females, is expected to be a barrier to equal opportunities in children's education attainments and their future labor market outcomes.

This transmission phenomenon allows us to explain another of the great conclusions obtained; that is to say, intergenerational educational transmission within these countries is determined by a range of factors, mainly conditioned by the degree of development. The dynamics the evolution of development result from a pattern of increases in the numbers of children with little training, the scarcity of opportunities in the educational environment, and the precariousness of the system—all of which comprise a structural burden that consolidates stagnation. Consequently, this allows us to conclude that educational transmission is a determinant that directly conditions economic growth and is a global measure of intergenerational equity. Of course, it has been widely demonstrated that an excessive level of intergenerational transmission of education poses a tremendous brake on economic growth, since it implies that individuals with talent, belonging to the lowest social strata, lack the opportunity to reach their full economic potential (Aydemir & Yazici, 2019; Campaña et al., 2017; Razzu & Wambile, 2022).

The contextualisation and socio-economic evolution of the different economies analysed allows us to document one of the objective hypotheses initially set out in this study, namely the interpretation that arises from the relationship between changes in the economic environment and changes in the educational sphere. This relationship is undoubtedly conditioned by the particularity of each of the countries presented, which allows us to see how different aspects and cultural traits directly influence the subsequent development. Patterns of behaviour delimited by the positive impact of centrally planned support programmes or conditioned by the existing differences in terms of the processes of colonial independence, are closely linked to the functions of both public and private school systems in the presence of deep ethnic divisions characteristic of certain countries.

In conclusion, this paper has delineated some of the (many) implications of intergenerational educational mobility, not only on the social spectrum, but also as an explanatory cause of many socio-economic factors. The fundamental role of human capital in developing countries highlights the great importance within these countries of the engine of future growth of these economies, although it undoubtedly gives rise to a wide range of alternatives to be investigated. The challenges of this line of study are to examine the implications of different political measures for gender inequality, and how these determine the relevant patterns of behaviour of households within these countries. Furthermore, future study should introduce such elements of family economics as the size of the family nucleus, the particular level of income, and the size of the municipality of residence, and how these elements play into the results obtained in reference to academic success. Finally, future research includes to update the sample period and to incorporate other countries in the analysis. With respect to limitations, we should indicated the rough measure of the academic level used in our data set, with this caveat having being limited given the advantage of using a large number of countries and years.

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Data Availability Available upon request.

Code Availability Available upon request.

Declarations

Conflicts of interest The authors declare that they have no conflict of interests.

References

Alain-Désiré, N., & Vencatachellum, D. (2007). Intergenerational education mobility of black and white South Africans. *Journal of Population Economics, 20*(1), 149–182.

Aydemir, A. B., & Yazici, H. (2019). Intergenerational education mobility and the level of development. *European Economic Review, 116*, 160–185. https://doi.org/10.1016/j.euroecorev.2019.04.003

Azomahou, T. T., & Yitbarek, E. (2021). Intergenerational mobility in education: Is Africa different? *Contemporary Economic Policy, 39*, 503–523. https://doi.org/10.1111/coep.12495

Becker, G. S., & Tomes, N. (1986). Human capital and the rise and fall of families. *Journal of Labour Economics, 4*, 1–47. https://doi.org/10.1086/298118

Behrman, J., Gaviria, A., & MiguelSzékely, M. (2001). Intergenerational mobility in Latin America. *Economy, 2*(1), 1–44.

Binder, M., & Woodruff, C. (2002). Inequality and intergenerational mobility in schooling: The case of Mexico. *Economic Development and Cultural Change, 50*(2), 249–267.

Bowles, S. (1972). Schooling and inequality from generation to generation. *Journal of Political Economy, 80*(3), S219–S251.

Campaña, J. C., Giménez, J. I., & Molina, J. A. (2017). Increasing the human capital of children in Latin American countries: The role of parents' time in childcare. *Journal of Development Studies, 56*(3), 805–825. https://doi.org/10.1080/00220388.2016.1208179

Campos-Vazquez, R. M. (2018). Intergenerational persistence of skills and socioeconomic status. *Journal of Family and Economic Issues, 39*, 509–523. https://doi.org/10.1007/s10834-018-9574-7

Checchi, D. (2001). Education, inequality and income inequality. *LSE Research online documents on economics 6566.* London School of Economics and Political Science, LSE Library.

Couch, K., & Dunn, T. (1997). Intergenerational correlations in labor market status: A comparison of the United States and Germany. *Journal of Human Resources, 32*, 210–232.

de Broucker, P., & Underwood, K. (1998). Intergenerational education mobility: An international comparison with a focus on postsecondary education. *Education Quarterly Review, 5*(2), 30–51.

Emran, M. S., & Shilpi, F. (2015). Gender, geography, and generations: Intergenerational education mobility in post-reform India. *World Development, 72*, 362–380. https://doi.org/10.1016/j.worlddev.2015.03.009

Ferrando-Latorre, S., Velilla, J., & Ortega, R. (2019). Intergenerational transmission of entrepreneurial activity in Spanish families. *Journal of Family and Economic Issues, 40*, 390–407. https://doi.org/10.1007/s10834-019-09613-7

Ganzeboom, H. B. G., Treiman, D. J., & Ultee, W. C. (1991). Comparative intergenerational stratification research: Three generations and beyond. *Annual Review of Sociology, 17*, 277–302.

Hassler, J., & Mora, J. R. (2000). Intelligence, social mobility, and growth. *American Economic Review, 90*, 829–846.

Hassler, J., Mora, J. R., & Zeira, J. (2007). Inequality and mobility. *Journal of Economic Growth, 12*, 235–259.

Heckman, J., & Hotz, J. (1986). An investigation of the labor market earnings of Panamian males evaluating the sources of inequality. *Journal of Human Resources, 21*(4), 507–542.

Hertz, T. (2001). Education, inequality and economic mobility in South Africa. Ph.D.diss., University of Massachussets. https://www.proquest.com/openview/5b35125bab4abfc17864c797ec478cb9/1?pq-origsite=gscholar&cbl=18750&diss=y.

Hertz, T., Meurs, M. & Selcuk, S. (2007a). The decline in intergenerational mobility in post-socialist Bulgaria. Department of Economics, American University, Washington, WP(Nº4).,http://www.american.edu/academic.depts/cas/econ/workingpapers/workpap.htm.

Hertz, T., Jayasundera, T., Piraino, P., Selcuk, S., Smith, N., & Verashchagina, A. (2007). The Inheritance of educational inequality: International comparisons and fifty-year trends. *The B.E. Journal of Economic Analysis & Policy*. https://doi.org/10.2202/1935-1682.1775

King, E. M., & Hill, M. A. (1993). *Women's education in developing countries: Barriers, benefits, and policies*. World Bank Books.

Li, X. S. (2021). What impacts young generations' school/college education through the lens of family economics? A review on JFEI publications in the past ten years. *Journal of Family and Economic Issues, 2021*(42), 118–123. https://doi.org/10.1007/s10834-020-09726-4

Lillard, L. A., & Willis, R. J. (1994). Intergenerational educational mobility: Effects of family and state in Malaysia. *Journal of Human Resources, 29*(4), 1126–1166.

Loury, G. C. (1981). Intergenerational transfers and the distribution of earnings. *Econometrica, 49*, 843–867.

Magnani, E., & Zhu, R. (2015). Social mobility and inequality in urban China: Understanding the role of intergenerational transmission of education. *Applied Economics, 47*, 4590–4606. https://doi.org/10.1080/00036846.2015.1031877

Majumder, M. A. (2016). The impact of parenting style on children's education outcomes in the United States. *Journal of Family and Economic Issues, 37*, 89–98. https://doi.org/10.1007/s10834-015-9444-5

Maoz, Y. D., & Moav, O. (1999). Intergenerational mobility and the process of development. *The Economic Journal, 109*, 677–697. https://doi.org/10.1111/1468-0297.00468

Meymotin, F. (2014). How parental involvement affects childhood behavioural outcomes. *Journal of Family and Economic Issues, 35*, 433–451. https://doi.org/10.1007/s10834-013-9383-y

Neidhöfer, G., Ciaschi, M. & Gasparini, L. (2021). Intergenerational mobility in Latin America. CAF Banco de Desarrollo de Latino America: Working Paper #2021/14: https://scioteca.caf.com/bitstream/handle/123456789/1845/Intergenerational%20mobility%20in%20education%20in%20Latin%20America.pdf?sequence=1&isAllowed=y

Neidhöfer, G., Serrano, J., & Gasparini, L. (2018). Educational inequality and intergenerational mobility in Latin America: A new database. *Cedlas Documento De Trabajo*. https://doi.org/10.1016/j.jdeveco.2018.05.016

Owen, A. L., & Weil, D. N. (1998). Intergenerational earnings mobility, inequality and growth. *Journal of Monetary Economics, 41*, 71–104. https://doi.org/10.1016/S0304-3932(97)00067-6

Persson, M. (2013). Is the effect of education on voter turnout absolute or relative? A multilevel analysis of 37 countries. *Journal of Elections, Public Opinion and Parties, 23*, 111–133. https://doi.org/10.1080/17457289.2012.747530

Razzu, G., & Wambile, A. (2022). Four decades of intergenerational education mobility in Sub-Saharian Africa. *The Journal of Developments Studies, 58*, 931–950. https://doi.org/10.1080/00220388.2021.2008366

Sánchez-Martín, N., & García Pérez, C. (2023). The intergenerational mobility of income: A study applied to the Spanish case

(2005–2011). *Journal of Family and Economic Issues, 44*, 65–83. https://doi.org/10.1007/s10834-021-09809-w

Sato, H and L. Shi (2007). Class Origin, Family Culture, and Intergenerational Correlation of Education in Rural China IZA Discussion Paper No. 2642

Solon, G. (1992). Intergenerational income mobility in the United States. *The American Economic Review, 82*, 393–408.

Solon, G. (2004). A model of intergenerational mobility variation over time and place. In M. Corak (Ed.), *Generational income mobility in North America and Europe.* Cambridge University Press.

Spady, W. G. (1967). Educational mobility and access: Growth and paradoxes. *American Journal of Sociology, 73*, 273–286.

Stacer, M. J., & Perrucci, R. (2013). Parental involvement with children at school, home and community. *Journal of Family and Economic Issues, 34*, 340–354. https://doi.org/10.1007/s10834-012-9335-y

Stranges, M. (2022). The intergenerational transmission of female labour force participation by gender among native and inmigrants Europeans: A focus on religion. *Journal of Family and Economic Issues, 43*, 774–798. https://doi.org/10.1007/s10834-021-09790-4