

Leone, Tharcisio

Working Paper

Intergenerational mobility in education: Estimates of the worldwide variation

UNRISD Occasional Paper - Overcoming Inequalities in a Fractured World: Between Elite Power and Social Mobilization, No. 2

Provided in Cooperation with:

United Nations Research Institute for Social Development (UNRISD), Geneva

Suggested Citation: Leone, Tharcisio (2019) : Intergenerational mobility in education: Estimates of the worldwide variation, UNRISD Occasional Paper - Overcoming Inequalities in a Fractured World: Between Elite Power and Social Mobilization, No. 2, ISBN 978-92-9085-103-5, United Nations Research Institute for Social Development (UNRISD), Geneva

This Version is available at:

<https://hdl.handle.net/10419/244371>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



United Nations Research Institute for Social Development

UNRISD

Intergenerational Mobility in Education: Estimates of the Worldwide Variation

Tharcisio Leone

Occasional Paper 2

**Overcoming Inequalities in a Fractured World:
Between Elite Power and Social Mobilization**

August 2019





The United Nations Research Institute for Social Development (UNRISD) is an autonomous research institute within the UN system that undertakes interdisciplinary research and policy analysis on the social dimensions of contemporary development issues. Through our work we aim to ensure that social equity, inclusion and justice are central to development thinking, policy and practice.

UNRISD, Palais des Nations
1211 Geneva 10, Switzerland
Tel: +41 (0)22 9173020
info.unrisd@un.org
www.unrisd.org

Copyright © UNRISD. Short extracts from this publication may be reproduced unaltered without authorization on condition that the source is indicated. For rights of reproduction or translation apply to UNRISD, which welcomes such applications.

The designations employed in UNRISD publications and the presentation of material therein do not imply the expression of any opinion whatsoever on the part of UNRISD concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The responsibility for opinions expressed rests solely with the author(s), and publication does not constitute endorsement by UNRISD.

Contents

Acronyms	ii
Abstract.....	ii
Acknowledgements	ii
Introduction	1
Understanding Intergenerational Mobility	3
Data Description	5
Empirical Approach.....	7
Empirical Results.....	9
The evolution of educational attainment	9
Transition matrix	16
Intergenerational persistence in education	21
Conclusions	26
Appendix	29
References	33

List of Figures

Figure 1: Children's educational levels	10
Figure 2: Parents' educational levels.....	10
Figure 3: Average years of schooling.....	12
Figure 4: Spread in schooling distribution	14
Figure 5: Education Kuznets Curve	15
Figure 6: Education Kuznets Curve, by income level	16
Figure 7: Upward mobility in education.....	17
Figure 8: Intergenerational mobility indexes (1980s cohort)	19
Figure 9: Intergenerational persistence in education (1980s cohort)	22
Figure 10: Regression and correlation coefficients	23
Figure 11: Evolution of persistence in schooling, by income level	25

List of Tables

Appendix Table: Measures of intergenerational educational mobility (1980s cohort) ..	29
--	----

Acronyms

GDIM	Global Database on Intergenerational Mobility
GDP	Gross Domestic Product
IGM	Intergenerational Mobility
ISCED	International Standard Classification of Education
PISA	Programme for International Student Assessment
SDGs	Sustainable Development Goals
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization

Abstract

This paper applies the recently published “Global Database on Intergenerational Mobility” to present a detailed picture of the chances of mobility around the world. The empirical results obtained from transition matrices and linear regression models, and based on harmonized data for education attainments of children and their parents from 148 countries, point to three main conclusions: first, the likelihood of attaining intergenerational mobility differs widely across countries and world regions; second, intergenerational persistence in education is particularly strong in the least-developed countries; and, finally – and perhaps most importantly – the mobility gap between poor and rich countries has increased over time.

Keywords

Intergenerational mobility, inequality, education

Author

[Tharcisio Leone](#) is an economist and research fellow at the German Institute of Global and Areas Studies (GIGA). Currently he is working on his doctorate at the Free University of Berlin, on the theme of intergenerational social mobility. His research concentrates mainly on educational economics, intergenerational mobility, equality of opportunity and social inequality.

Acknowledgements

This paper was written during a visiting research fellowship at UNRISD, Geneva, Switzerland. I am very grateful to Katja Hujo and Maggie Carter for their research support. I would like to thank also the external reviewer of this paper and the participants of the 12th RGS Doctoral Conference in Bochum for helpful comments and suggestions on a previous version of this paper. Finally, I want to express my great gratitude to the Friedrich Ebert Foundation for providing me with funding during my research stay.

Introduction

Understanding the mechanisms behind the reproduction of income inequalities has gradually taken on an increasing importance for policymakers and the scientific community. A growing body of literature indicates that families play a powerful role in shaping children's abilities and, consequently, their achievements as adults. The "accident of birth" is a primary source of inequality and serves as an important mechanism in perpetuating income disparities in modern society.¹

These studies address the issue of intergenerational mobility (IGM) and are aimed at investigating how much of children's education, earnings, income and wealth can be predicted by looking at the outcomes of their parents (Blanden and Macmillan 2011; Black and Devereux 2010). The topic of intergenerational mobility presents itself as an interdisciplinary field of research and refers to the extent to which socioeconomic outcomes, such as income, education or occupation, are likely to change across different generations within a single family. In the hypothetical case of a complete lack of IGM in education, for example, children from illiterate parents would become illiterate adults, while those from parents with a tertiary education would also achieve a college degree.²

The topic of IGM has attracted increasing attention outside of academia and is becoming one of concern for policymakers both in developing and industrialised countries. In the United Kingdom, for example, the "Social Mobility Commission" was established in 2016 with the goal of monitoring progress towards improving social mobility.³ In 2013, United States President Barack Obama called for government action to address the lack of social mobility in the country (Obama 2013). The importance of "opportunities for all" was also raised during the first speech of former Brazilian president Dilma Rousseff on the occasion of her inauguration (Rousseff 2011).

The adoption of the 2030 Agenda for Sustainable Development in September 2015 brought the topic of IGM to the centre of the political debate. In many of the 17 Sustainable Development Goals (SDGs) it is possible to identify the ambition to increase opportunities for the younger generations, leading the world to a situation in which the chances of success are less dependent on inherited characteristics and more on individual choices. SDG 4, for example, aspires to "promote lifelong learning opportunities for all", indicating that the chances of education should be open to all people, irrespective of their individual characteristics or family (socioeconomic) background (United Nations, 2015).

This focus on education finds its fundamentals in economic literature. Using the human capital theory, a wide range of empirical studies have pointed to a positive association between years of schooling and future earnings, highlighting in this way the crucial role of education for the chances of eventual social mobility. In this context, the investigation of current educational inequality can provide an important contribution to our understanding of the evolution of future income inequality.⁴

¹ See, for example, Roemer and Ünveren (2017), Fox et al. (2016), Guner (2015), Corak et al. (2014), Björklund and Jäntti (2009), Cunha and Heckman (2007), Duncan et al. (2005) and Mazumder (2005) for reviews of the literature.

² Azam and Bhatt 2015; Corak 2004; Piketty et al. 2000.

³ Welfare Reform and Work Act of Great Britain, 2016. Accessed 19 September 2018. http://www.legislation.gov.uk/ukpga/2016/7/pdfs/ukpga_20160007_en.pdf.

⁴ Azam and Bhatt 2015; Blanden and Macmillan 2014; Gregg and Macmillan 2010. However, it should also be emphasized that some renowned authors advocate for the exceptional importance of non-education-related factors for social mobility, given that a (higher) education degree does not necessarily represent a guarantee of employment or higher earnings (see, for example, Arifin 2017; Young 2017; Haveman and Smeeding 2006).

In the face of rising political interest in social mobility, some clarifications on these matters are necessary in order to ensure that policy priorities are correctly determined and public resources allocated in an efficient way. It is in this sense that the present work intends to contribute to the academic literature. This paper aims to improve the understanding of the global variation in mobility providing useful insights for policy makers into internationally comparable measures of intergenerational persistence in educational attainment for 148 countries, covering around 96 percent of the world's population. This global investigation of mobility, difficult to undertake until recently, has been made possible by the publication of the "Global Database on Intergenerational Mobility" (GDIM), a harmonised statistical database on educational attainment and income level of individuals and their respective parents.

The GDIM was created by the Development Research Group of the World Bank and made available to the public in May 2018. In July of the same year, the World Bank published a detailed report entitled "Fair Progress? Economic Mobility across Generations around the World", wherein the empirical results from the GDIM were presented to the general public (Narayan et al. 2018). The main finding presented in this report is that intergenerational mobility tends to be much higher in high-income countries than in developing ones, a fact that has not changed over the last decades. According to the World Bank report, this gap between country groups has been widening because (on average) developing countries have not been able to increase mobility chances for their population for those born during the last forty years.

However, this simple way of categorizing (developing) countries may lead to misperceptions about progress in intergenerational mobility, and it is in this regard that this paper intends to contribute to the literature. The present study uses the main conclusion of the World Bank report as a starting point in order to investigate in more depth the *distribution of mobility chances* around the world. While the study of the World Bank was focused mainly on the comparison of mobility between two groups of economies (developing and high-income countries), this paper will expand this investigation presenting the mobility chances divided by geographic world regions and also four income groups, providing in this way more detailed insights for the understanding of the global variation of intergenerational mobility. The other relevant contribution of this paper to the literature is the presentation of empirical evidence for the development of educational attainment and inequality in schooling across the 148 surveyed countries. As we will see in the following sections, the success or failure of countries in increasing over time the average years of schooling in society plays a crucial role for mobility chances. However, for methodological reasons, this investigation was not part of the World Bank report.

The results of my analysis indicate a general improvement in educational attainment and at the same time a steady reduction in the inequality of schooling in all regions of the world over the last five decades. In relation to mobility, the empirical evidence points to two important mechanisms in the perpetuation of inequalities across generations. First, the chances of achieving educational success differ greatly between rich and poor countries, and, second, the intergenerational transmission of privileges is particularly strong in the least-developed countries. Around 60 percent of people born in Norway between 1980 and 1989 have attained a university degree, while the same proportion is only five percent in Mali. However, if a child in Mali is born into a family with a tertiary education, then their probability of achieving a college degree increases to 60.4 percent, greater than the likelihood of doing so in Norway.

Particularly relevant, and worrying, is the evolution of IGM over time. In low-income countries, intergenerational educational persistence for the generation born in the 1980s is greater than for

persons from the 1940s cohort, indicating that chances of mobility have actually decreased. Given that the more developed countries present the opposite trend, the mobility gap between poor and rich countries has become even bigger during the last few decades.

The remainder of the article proceeds as follows. In the next section, I summarize the current knowledge on the topic of IGM, focusing on the most relevant theoretical and methodological contributions. Section 3 presents the GDIM. The fourth section contains the empirical approaches used for the estimations, while the main empirical findings are reported and discussed in section 5. Finally, section 6 ends with the conclusions.

Understanding Intergenerational Mobility

A review of existing literature on the topic of IGM shows that empirical studies have used three different outcomes for the measurement of mobility: income, education and professional occupation.⁵ However, independent of the outcome used for the measuring of mobility, these empirical estimations are not a straightforward matter, and all three of these approaches have methodological weaknesses (Björklund and Jäntti 2009; Hertz 2007).⁶

Ideally, an empirical investigation of income mobility across generations requires, for example, data on the lifetime (or permanent) income of parents and children.⁷ This would require a survey that runs for up to 80 years, (equivalent to the whole length of parents' and their children's professional life) capturing the total income of both generations. However, in most international studies, this condition is not satisfied, because the databases used tend to contain only short-term information about income status, meaning only monthly or annual earnings (Björklund and Jäntti 2009; Hertz 2007).

Given this limitation, researchers estimate lifetime income based on short-term earnings.⁸ Renowned studies have already demonstrated that this approach does not necessarily generate accurate estimates of permanent income, because these estimations are exposed to life-cycle biases.⁹ This is the case when, at the time of the sample selection, parents are in an advanced stage of their career with at least 20 years of work experience, while their children are still at an early stage of their professional life (Black and Devereux 2010).

In the same way, the use of professional occupation categories for the measurement of IGM cannot be taken as a method free of bias (Altham and Ferrie 2007). As has been described in greater detail by Long and Ferrie (2013), the key problem with this measure is that the level of mobility is estimated based on (different) occupational structures for children and parents. Within this approach, researchers apply the same occupational classification for a parent's and child's

⁵ Most notable among various contributions to the literature on IGM were the landmark studies of: Bratberg et al. (2017), Chetty et al. (2014b), Lee and Solon (2009) and Corak (2006) for income mobility; Azam and Bhatt (2015), Checchi et al. (2013), Daude (2011), Aydemir et al. (2013), Hertz et al. (2007) and Bourguignon et al. (2007) for education mobility; and, Torche (2014), Long and Ferrie (2013), Altham and Ferrie (2007), and Matras (1961) for occupational mobility.

⁶ Concise and comprehensive literature overviews on the topic of IGM are provided by Fox et al. (2016), Jäntti and Jenkins (2015), Blanden (2013), Black and Devereux (2010), Björklund and Jäntti (2009), Mazumder (2005), Solon (1992), Piketty et al. (2000) and Checchi et al. (1999).

⁷ The term "lifetime income" refers to the aggregate income which individuals have earned over their entire lifetime (Corneo 2015).

⁸ Nybom and Stuhler 2017; Mazumder 2016; Black and Devereux 2010.

⁹ See, for example, Mazumder (2005), Solon (1992), and Zimmerman (1992).

occupations and then investigate the association between rows and columns across the created transition matrices.

However, the empirical results tend to become biased in the case of a variation over time in the socioeconomic status related to occupations. Some professional occupations can experience sharp deterioration in their status over years, changing in this way their market remuneration and their position within social classifications. In the last decades, for example, there was an increase in the demand for more skilled jobs. Therefore, it is reasonable to expect that the remuneration and socioeconomic status from workers in farming or in unskilled manual jobs is lower in the generation of children compared to parents (Altham and Ferrie 2007; Long and Ferrie 2013).

In view of these empirical limitations, the use of educational attainment is playing an increasingly important role for research on IGM and has been justified by the extensive literature confirming the strong association between educational attainment and lifetime earnings: basically, the higher the education level, the higher the earnings.¹⁰ In contrast to income, the approach based on education has the advantage of being less exposed to a life-cycle bias. Generally speaking, individuals tend to finish their education around the age of 25 and the investigation of IGM can be carried out also with people at the beginning of their working lives.

In addition, the use of education as a measure of mobility can address the problem of informality in the labour market, mainly present in developing countries – where a significant portion of workers are in the informal sector (Azam and Bhatt 2015; Black and Devereux 2010). Compared to professional occupation, the use of educational attainment does not present the problem of estimation bias in case of a variation in the socioeconomic status across generations. As will be shown in the following sections, this approach allows us to take into account the changes over time in the socioeconomic status related to schooling (Nybom and Stuhler 2017; Jäntti and Jenkins 2015).

However, the use of educational attainment for the measuring of IGM presents two important limitations. First, it does not take into account the quality of education – thereby making the outcome an imperfect proxy for skill level. The World Development Report 2018, entitled *Learning to Realize Education's Promise* (World Bank 2018), for example, makes clear that schooling is not the same as learning. In this policy report, the World Bank states that the quality of education is very low in many education systems around the world – particularly in low- and middle-income countries. The second limitation is that educational attainment does not capture several other drivers affecting income level and mobility chances, those which are not exclusively transmitted by education, such as non-cognitive abilities, parental connections or information-processing skills rewarded in the labour market (Narayan et al. 2018).

In recent years we observe an increase in the number of empirical studies focusing on cross-country rankings of IGM.¹¹ The majority of these studies have concentrated on only a handful of countries given the difficulty of obtaining reliable and harmonized data sources containing

¹⁰ See, for example, Heckman et al. (2016), Tamborini et al. (2015), Plewis and Bartley (2014), Breen and Karlson (2013), Heckman et al. (2006) and Psacharopoulos and Patrinos (2004) for a selective review of the literature on schooling and lifetime income. Card (1999), meanwhile, helps us to understand the possible causal effects of education on earnings.

¹¹ Neidhöfer et al. (2018), Torul and Oztunali (2017), Blanden (2013), Ayala and Sastre (2008), Hertz et al. (2007), Jantti et al. (2006), Aaberge et al. (2002), Behrman et al. (1999) and Ganzeboom and Nieuwbeerta (1999) are some of the most relevant cross-country studies concerning IGM.

information on economic outcomes for different generations. This limitation is especially strong for developing countries.¹²

To the best of my knowledge, Hertz et al. (2007) were the authors that came as close as anyone to creating a globally universal and comparable measure of IGM. They have provided comparable estimates of intergenerational educational persistence for 42 countries around the world and indicate a clear trend: Latin American countries have, on average, the lowest levels of education mobility across generations. Scandinavian countries are found on top of the mobility scale, presenting the lowest level of persistence in educational attainment between parents and children, followed by Africa, Western Europe and the USA, Asia and the Eastern Bloc respectively.¹³ Despite the significant contribution of Hertz et al. (2007), however, the international literature remains limited, given that this paper provided estimations of mobility for only about one-fifth of the world's countries. This is the context in which the GDIM project was set up.

Data Description

The investigation of the worldwide variation in intergenerational educational mobility undertaken in this paper is based on the newly created GDIM. It provides empirical evidence of educational mobility for 148 countries – thus covering around 96 percent of the world's population – and data on income mobility for around 70 economies. The GDIM-project was launched by the Development Research Group of the World Bank to be the most comprehensive global source of comparable measures of IGM.

The GDIM is part of the efforts of the World Bank, jointly with the Equal-Chances project, coordinated by the Department of Economics and Finance of the University of Bari, to generate empirical evidence for IGM around the world. A comprehensive presentation of the results can be found in the earlier-mentioned report "Fair Progress? Economic Mobility across Generations around the World" (Narayan et al. 2018).

As the overall aim of this paper is to provide a more comprehensive overview on the variation of mobility around the world, the empirical findings presented in this study are focused on the data of educational attainment, representing almost complete worldwide coverage. The GDIM is a harmonized database, meaning that the World Bank collected data from 148 different nationally representative longitudinal surveys in which information about the educational attainment of the respondents and their parents was available. The next step was to harmonize this data set into a single micro database to enable direct comparisons across economies. For this purpose, the GDIM first excluded from the sample children under the age of 18 and persons who were still enrolled in school. The GDIM made an exception to this rule, however, to take into account students enrolled in higher education: respondents aged 20 or older who have completed upper secondary education and were enrolled in post-secondary schooling have been retained in the sample. In these cases, the individuals were categorized as having completed a tertiary degree, in order to reflect a final educational outcome. The GDIM harmonised a continuous variable with values

¹² Narayan et al. 2018; Hertz et al. 2007; Ferreira and Veloso 2006

¹³ The empirical investigation of Hertz et al. (2007) was based on the following countries: Brazil, Chile, Colombia, Ecuador, Nicaragua, Panama and Peru for Latin America; Denmark, Finland, Norway and Sweden for Scandinavia; Egypt, Ethiopia, Ghana and South Africa for Africa; Belgium, Ireland, Italy, the Netherlands, New Zealand, Northern Ireland, Switzerland, the United Kingdom and the USA for Western Europe and the USA; Bangladesh, China, East Timor, Indonesia, Malaysia, Nepal, Pakistan, the Philippines, Sri Lanka and Vietnam for Asia; and, Czech Republic, Estonia, Hungary, Kyrgyzstan, Poland, Slovakia, Slovenia and Ukraine for the Eastern Bloc.

between zero and 21 indicating the number of completed years of schooling. In most cases, national surveys already provided this information. In countries where this variable did not exist, the GDIM created years of schooling based on the highest level of education or training attained by the individuals in question, taking into consideration the structure and functioning of the different countries' education systems.¹⁴

Subsequently, the educational achievement of parents and children were classified into five categories, according to the International Standard Classification of Education (ISCED): less than primary (ISCED 0); primary (ISCED 1); lower secondary (ISCED 2); upper secondary or post-secondary non-tertiary (ISCED 3–4); and, tertiary (ISCED 5–8).¹⁵ For surveys in which the educational achievement was missing, the GDIM constructed this variable based on the years of schooling.¹⁶ Finally, in order to provide a visualisation of global trends and patterns in IGM over time, the sample provided information for individuals born between 1940 and 1989 divided into five 10-year cohorts.¹⁷

The GDIM reported the measures of intergenerational mobility estimated by different pairs of children/parents. For the generation of children, it presents mobility indicators based on the educational attainment of sons, daughters and a measure of average education among both. For the parents' generation, it differentiates between fathers and mothers, as well as average and maximal value between fathers and mothers. In the following sections, this paper will use both gender groups for the children cohorts (sons and daughters) and the maximal educational attainment (the higher value) of fathers and mothers for the investigation of IGM.¹⁸ Despite the substantial improvement of data quality for the measuring of IGM provided by the GDIM, some limitations need to be mentioned. In addition to quality of education already mentioned in section 2, another potential source of bias in the harmonization of this database is co-residency.

For 37 of the 148 surveyed countries, there was no data with retrospective information about parental education. For this reason, this variable needed to be calculated based on the data of respondents who were living with their parents in the same household at the moment of survey. The implication of this approach is the appearance of a co-residency bias, because the older the children are, the lower the percentage living with their parents.

In order to reduce the co-residency bias on the estimates of mobility, the GDIM limited the investigation in these 37 countries to children aged between 21 and 25 years old.¹⁹ As a consequence, for 37 countries, the GDIM provided no empirical evidence of mobility for

¹⁴ Only as illustrative examples: individuals with a doctoral or equivalent level have 21 years of education, master's or equivalent level 18 years, bachelor's or equivalent level 16 years, upper secondary education 12 years, lower secondary education nine years and primary education six years.

¹⁵ See UNESCO (2003) for a detailed description of the ISCED.

¹⁶ The classification was done using the following parameters: six years of schooling correspond to ISCED 1, nine years to ISCED 2, 12 years to ISCED 3, 13 years to ISCED 4, 15 years to ISCED 5, 16 years to ISCED 6, 18 years to ISCED 7 and 21 years to ISCED 8.

¹⁷ In order to ensure accuracy in the estimations, avoiding sampling errors as a result of small sample sizes, all measurements of IGM presented in the GDIM are based on at least 50 observations. In this paper only seven measures with less than 100 observations have been used: Tajikistan (88), Comoros (83), Vietnam (82), Sri Lanka (81), Turkey (75) and Iceland (71) for the 1940s cohort, and Tuvalu (64) for the 1980s generation.

¹⁸ In Benin, Chad and the Democratic Republic of Congo, no national survey with information about the educational achievement of mothers was found. For this reason, IGM for these countries was measured based exclusively on the father's education.

¹⁹ Using co-residency bias checks, the GDIM has shown that for the population aged 21–25 it tends to be very low. Based on surveys that allow for comparison of the educational attainment of all respondents aged between 21 and 25 years old with the values from co-residents of the same age, the authors point out that co-residents have a slightly greater probability of exhibiting a higher schooling than the whole group – which would lead to a slight overestimation of the measures of IGM. See Narayan et al. (2018) for more details.

individuals born before 1980. Because of this limitation, while I will use schooling data of children and parents for 148 countries when I look at the 1980s cohort, my analysis of the evolution of mobility over time will be limited to 111 economies (87 percent of the global population) where retrospective information about parental education is available.²⁰

Empirical Approach

Based on the GDIM, the empirical part of this paper aims at depicting the variation in intergenerational education mobility across nations and over time – using, as noted, empirical evidence for 148 countries and five different birth cohorts. For this purpose, it is essential to keep in mind the worldwide evolution of educational attainment over the last few decades. The section presenting the empirical results of this paper begins by providing summary statistics on the average level of education and two measures of the spread in schooling distribution: the Gini coefficient (*Gini*) and the standard deviation (σ), using the following formulas:

$$Gini = 1 + \frac{1}{N} - \frac{2}{\bar{x}N^2} \sum_{i=1}^N (N-i+1)x_i \quad (1)$$

$$\sigma = \frac{1}{N} \sum_{i=1}^N (x_i - \bar{x})^2 \quad (2)$$

In Equations 1 and 2 above, i identifies the rank of every individual in the population N , x_i the observed years of schooling of individual i and \bar{x} the average educational attainment among the population (Azam and Bhatt 2015; Meschi and Scervini 2013; Hertz et al. 2007). The Gini coefficient has a lower and upper bound and is used as a measure of relative inequality of schooling distribution. This coefficient takes the minimum value of zero if everyone in the country has the same educational attainment and the maximum value of one if only one person has an education and all other people have no schooling. By contrast, the standard deviation is unbounded and presents a measurement of dispersion of schooling distribution in absolute terms (years of schooling). Because this index is based on squared values, we can expect that the standard deviation measures will be more influenced by outliers (excessively low or high values of schooling) than the Gini coefficient – which is based on single values of schooling (De Maio 2007; Thomas et al. 1999; Dorfman 1979).

For the investigations of mobility, this paper applies the two standard empirical techniques found in the economic literature for the measure of intergenerational persistence in educational attainment: transition matrix (see, for example, Daouli et al. 2010; Heineck and Riphahn 2009; Jantti et al. 2006) and intergenerational correlation (see, for example, Blanden and Macmillan 2014; Black and Devereux 2010; Hertz et al. 2007). The first empirical approach estimates square matrices based on the ISCED classification scheme outlined in section before. The probability of a child from parents with the education level l ending up with educational attainment j is expressed as ρ_{lj} , where $0 \leq \rho_{lj} \leq 1$. Given that this paper is using the same five categories for the educational levels of children and parents, the probabilities can be represented in a 5×5 matrix as $P = [\rho_{lj}]$ with $\sum_{j=1}^5 \rho_{lj} = 1$ for $l, j = 1, 2, \dots, 5$ (Bazzi et al. 2017; Van de Gaer et al. 2001; Matras 1961). In a formal sense, let us assume that gamma (Γ) is a set of all bi-stochastic matrices P :

$$\Gamma = \{P \mid \rho_{lj} \geq 0 \forall \rho_{lj}, \sum_{l=1}^5 \rho_{lj} = 1, \sum_{j=1}^5 \rho_{lj} = 1\} \quad (3)$$

²⁰ Regarding the population, the regional coverage of GDIM achieves a rate of 94 percent for high-income economies, 96 percent for East Asia and the Pacific, 99 percent for Eastern Europe and Central Asia, 96 percent for Latin America and the Caribbean, 81 percent for the Middle East and North Africa, 100 percent for South Asia and 95 percent for sub-Saharan Africa. With the retrospective data, coverage reaches respectively 94, 92, 99, 96, 49, 89 and 72 percent.

The second established way to measure educational mobility between parents and children is based on intergenerational regression models, and dates back to Becker and Tomes (1979, 1986). In this empirical model, the regression coefficient shows the percentage change in child educational attainment associated with a percentage change in parental educational attainment.

$$educ_i^{child} = \alpha + \beta educ_i^{parent} + \varepsilon_i \text{ with } \beta \in (0,1) \quad (4)$$

where $educ_i^{child}$ is the (number of) years of schooling for a child i , $educ_i^{parent}$ is the same educational outcome for his (most educated) parent, α is the average years of schooling in the generation of children and ε_i is an error term capturing all the other determinants that affect the children's schooling but are not correlated with parental education (Azam and Bhatt 2015; Checchi et al. 2013; Smeeding et al. 2011).

The regression coefficient β is known in the economic literature as the “grade of persistence” and captures the intergenerational persistence in education between parents and children, showing the extent to which educational outcomes are transmitted across generations.²¹ The closer the value of β to zero, the lower the impact of parent's schooling on the educational outcomes of children (in other words, the higher the level of IGM). A persistence of 0.5, for example, indicates that if the parent's schooling differs in two separate years from the average educational attainment in his/her generation, the education of the child will differ in one year from the average education in their own one (Guner 2015; Blanden 2013; Aaronson and Mazumder 2008).

In a simple linear regression, as with Equation 4 above, the coefficient β corresponds to the association between $educ_i^{child}$ and $educ_i^{parent}$ corrected by the ratio of standard deviations of these variables.²² If countries accumulate more human capital over time, in case for example, of an increasing net enrolment ratio or changes in compulsory education (“elevator effect”), then the estimations of β will be affected by the variation of standard deviation in schooling across both parents' and children's generations. As we will see in detail in the following section, the standard deviation in educational attainment takes the form of an inverse U-shape as a function of the average years of schooling – given that the standard deviation normally tends towards zero when the years of schooling approximate to its minimum or maximum values. Hence, in the case of a rise in average years of schooling over generations, the effects of evolution in standard deviations will negatively affect the estimations of β (Narayan et al. 2018).

Given this particular aspect in the measure of education mobility, a natural complement to the regression coefficient has been the correlation coefficient (ρ). I follow Azam and Bhatt (2015), Checchi et al. (2013) and Hertz et al. (2007) and estimate Equation 5 below, in order to normalize the schooling of parents and children by the corresponding standard deviation.

$$\frac{educ_i^{child}}{\sigma_{child}} = \alpha + \rho \left(\frac{educ_i^{parent}}{\sigma_{parent}} \right) + \varepsilon_i \quad (5)$$

In this model, I used the standard deviation of educational attainment in the generation of children and parents from Equation 2 above to estimate the “correlation coefficient” (ρ), presenting in this way a measure of IGM free from bias caused by changes over time in the inequality of educational outcomes.²³

This paper follows the international convention presented in the economic literature and thus reports separately the values of the regression coefficient β and the correlation coefficient ρ . For the empirical evidence of mobility presented in the next section, Equations 3, 4 and 5 were based on the schooling of all children (boys and girls) and the educational attainment of their most-

²¹ Alternatively, many studies use the measure $(1 - \beta)$ to present the level of IGM in education.

²² Statistically we have $\beta = \rho(\sigma_{parent}/\sigma_{child})$, where σ_{parent} and σ_{child} correspond respectively to the standard deviation of educational attainment in the generations of both children and parents.

²³ The “correlation coefficient” (ρ) is also called in the literature “relative mobility” or “standardized persistence”.

educated parent. In addition, the equations were also estimated separately for each of the five 10-year birth cohorts in order to identify any possible variation in IGM over time.

Empirical Results

This section summarizes the empirical findings from the GDIM.²⁴ First, I will present information about the worldwide evolution of educational attainment and its effects on education inequality (measured as Gini coefficient and standard deviation). In the following, the focus will be specifically on the estimations of IGM in schooling – presenting the results from the transition matrices approach and the empirical evidence from the OLS regressions.²⁵

The evolution of educational attainment

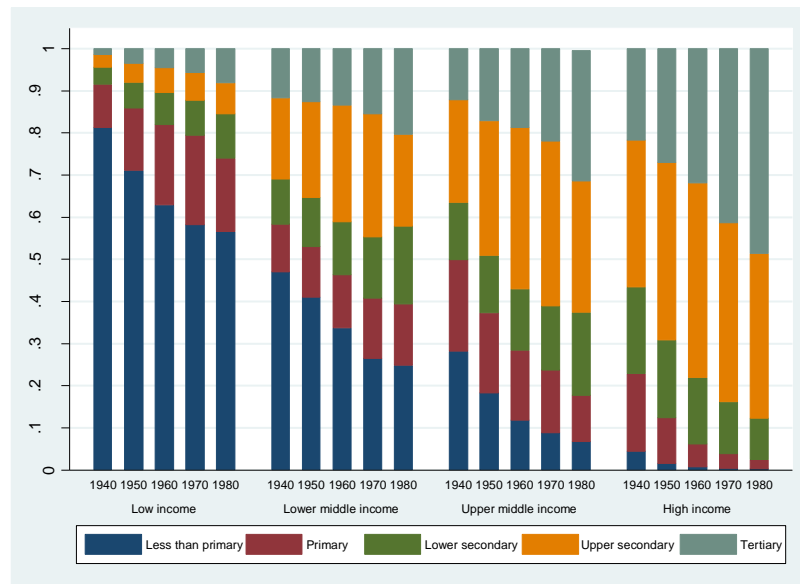
I start the investigation by presenting summary statistics on educational levels. Figures 1 and 2 use the ISCED classification presented above to give a detailed view of the distribution of educational outcomes. Note that, overall, the share of individuals who have not attained full primary education is going down and education at higher levels – mainly upper secondary and tertiary – is becoming gradually more prevalent. However, the education gap between rich and poor countries remains high. The chance of a child born in a high-income country between 1980 and 1989 achieving a tertiary education degree is around six times greater than among their peers from low-income countries (48.7 percent compared to 8.3 percent). The same chance is 2.4 times higher when compared to children born in lower middle-income countries and 1.6 times in comparison with upper middle-income countries. While the share of individuals without a primary education in high-income countries remains below one percent after the 1960s cohort, the same proportion exceeds 65 percent for children with origins in low-income countries.²⁶

²⁴ The estimates of intergenerational mobility used for creating all the figures can be found in the appendix table.

²⁵ In order to identify worldwide patterns in mobility, the results in this section are reported for groups of countries as average values – those that correspond to simple means for all countries within their respective group and unweighted by population – in order to prevent mobility trends being dominated by a few countries with large populations. For single information by country, see the appendix table providing a complete list of the national-level results for mobility.

²⁶ The share of children with no primary education in high-income countries reached 4.5 percent in the 1940s cohort, 1.6 percent in the 1950s, 0.8 percent in the 1960s, 0.5 percent in the 1970s and 0.3 percent in the 1980s ones. The same proportions for the low-income nations are respectively: 81.2, 71.0, 62.9, 58.2 and 56.5 percent.

Figure 1: Children's educational levels

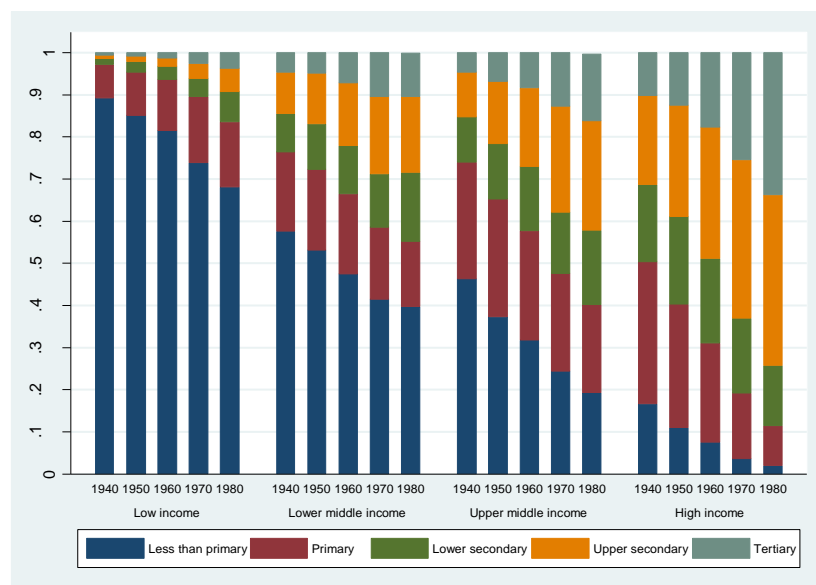


Source: Author's own compilation based on "Global Database on Intergenerational Mobility" (GDIM).

Notes: Estimations for boys and girls. Average values are unweighted by countries' populations.

This extremely unequal situation does not change when we take into consideration the parent's generation (see figure 2). Also, in this generation, we can identify a strong gap in educational achievement across the 148 investigated countries. Around 90 percent of the parents of children born in low-income countries between 1940 and 1949 have no primary education diploma. The same proportion is 18 percent in high-income countries.

Figure 2: Parents' educational levels



Source: Author's own compilation based on GDIM.

Notes: Estimations refer to the educational attainment of the better-educated parent. Average values are unweighted by countries' populations.

In order to provide the reader with a more comprehensive view of the inequality in educational attainment, I present summary statistics on years of schooling (figure 3) and results of two measures of spread in education attainment, highlighting in this way how scattered the values of

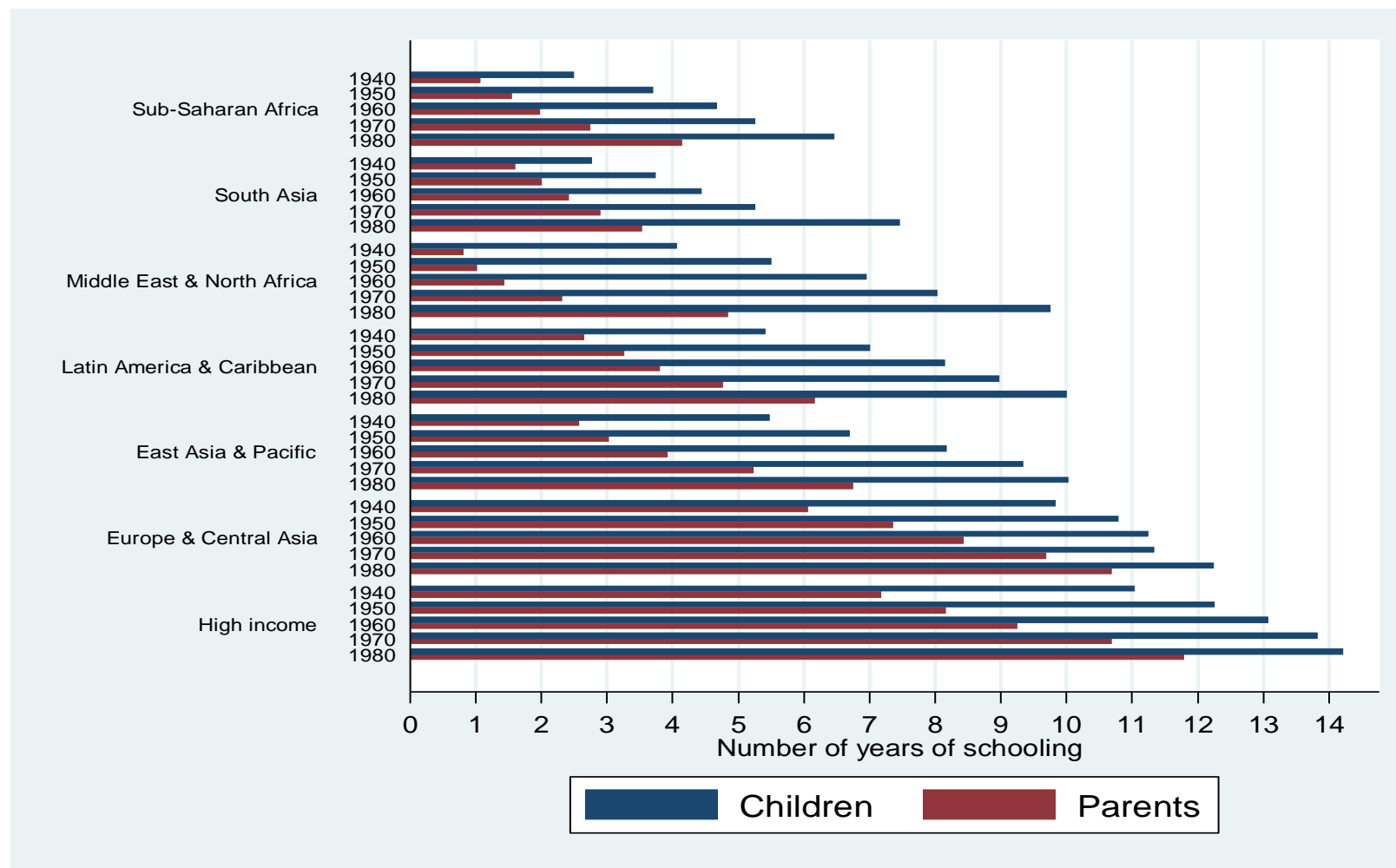
schooling in the dataset are (figure 4). The y-axis of the graphs provides the results by birth cohorts and geographic regions of the world. In order to highlight the data of developing economies, I fit all the high-income countries into one category and separate the developing countries into six regions.²⁷

Figure 3 shows that (on average) children tend to be more educated than their parents and it indicates also a general improvement over time in the average years of schooling for both generations. Proportionally, this growth was higher in South Asia and sub-Saharan Africa: persons born in South Asia between 1940 and 1949 have on average 2.7 years of schooling, while average education increased to almost 7.5 years schooling for the 1980s cohort (an increase of 170 percent). In other regions of the world, this rise achieved respectively 160 percent in sub-Saharan Africa, 140 percent in the Middle East and North Africa, 85 percent in Latin America and the Caribbean, 83 percent in East Asia and the Pacific, 28 percent in high-income countries, and 24 percent in Europe and Central Asia.

Despite this relatively strong growth, countries from South Asia and sub-Saharan Africa keep presenting very low levels of educational attainment when compared to more developed countries elsewhere. Persons born in sub-Saharan Africa in the 1980s cohort, for example, have on average around one-half of the schooling years of persons from high-income countries born between 1940 and 1949 (respectively 6.5 and 11 years). In addition, the data from the GDIM indicate that the gap in schooling across world regions has remained relatively constant over the last five decades: in the 1940s cohort the highest difference was 8.5 years between high-income nations and sub-Saharan African countries. Fifty years later, this gap narrowed to about 7.7 years.

²⁷ Figure 8 lists the countries falling within the category "high-income".

Figure 3: Average years of schooling



Source: Author's own compilation based on GDIM-2018.

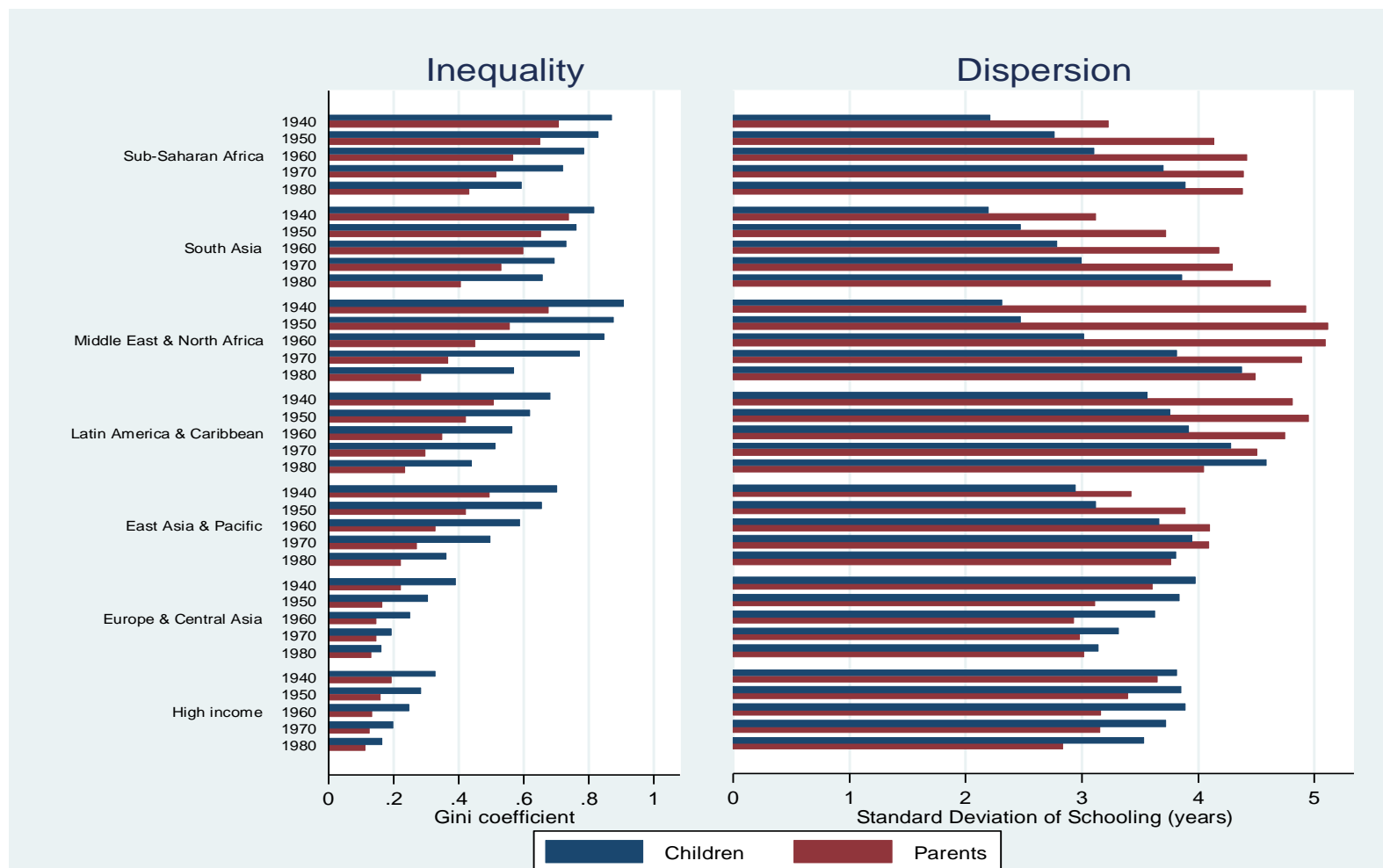
Notes: Children's education for boys and girls. Parents' schooling refers to the educational attainment of the better-educated parent. Average values are unweighted by countries' populations.

Figure 4 provides more in-depth information on the distribution of educational attainment, and confirms a trend already identified by Thomas et al. (1999): there is a negative correlation between average years of schooling and inequality in education, as measured by the Gini coefficient. Countries with higher values of average educational attainment are more likely to attain (higher) equality in schooling than those nations with lower educational levels. Note that high-income economies present not only higher average years of schooling, as shown in figure 3, but the inequality in education among their inhabitants is also lower when compared to developing countries.

A positive finding from figure 4 is that inequality in education has declined over time in all regions of the world; or, in other words, the years of schooling are becoming more homogeneous in society. Countries from the Middle East and North Africa have achieved – with a value of 0.397 – the greatest reduction in the average Gini coefficient between 1940 and 1989 (it dropped from 0.679 to 0.282). This is followed respectively by South Asia (0.332), sub-Saharan Africa (0.276), Latin America and the Caribbean (0.273), East Asia and the Pacific (0.271), Europe and Central Asia (0.088), and high-income countries (0.082).

On the other hand, figure 4 presents no clear pattern for the standard deviations of schooling. Note that in some regions of the world this measure of inequality in schooling is higher in the generation of children than in the parent's one (Europe and Central Asia, and high-income countries), while other regions demonstrate the opposite trend. In addition, it is possible to observe that in Europe and Central Asia as well as in high-income countries the standard deviation for both generations has decreased across birth cohorts – while in other regions of the world it has gone up. These conflicting findings leave open the question about the evolution of the distribution in educational attainment over time and world regions.

Figure 4: Spread in schooling distribution



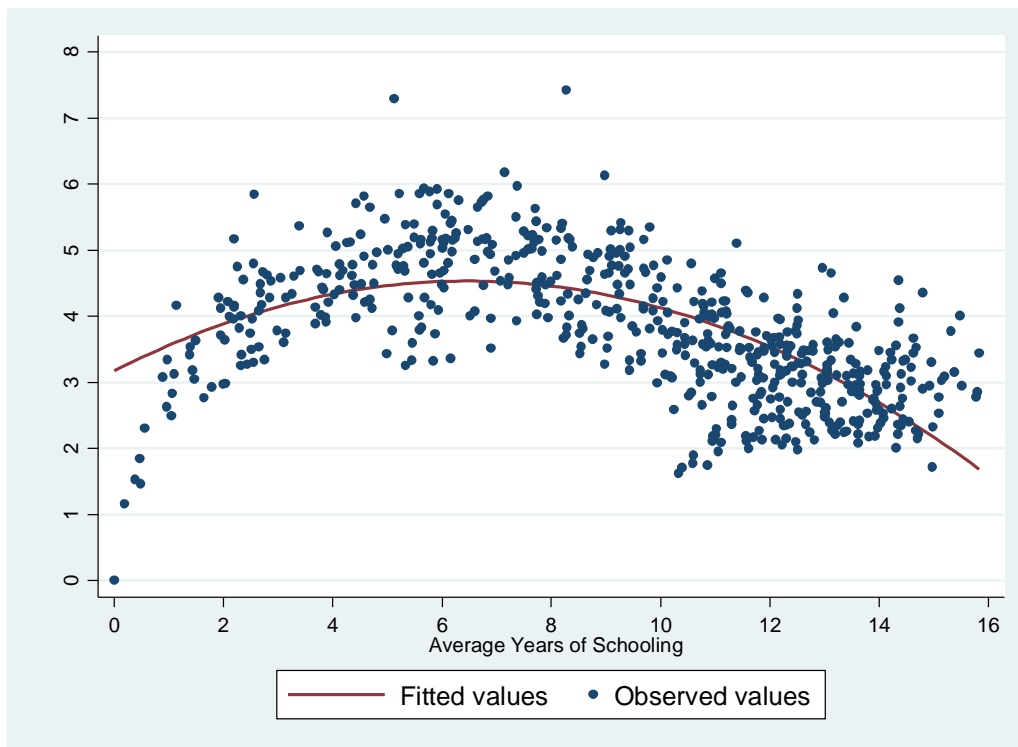
Source: Author's own compilation based on GDIM.

Notes: Children's education for boys and girls. Parents' schooling refers to the educational attainment of the better-educated parent. Average values are unweighted by countries' population.

As described in detail by Meschi and Scervini (2013), an expansion of average educational attainment will be followed by a reduction in the dispersion of education only if the least-educated classes also benefit from this increase in schooling. Otherwise, the education gap in society will increase, given that the most highly skilled individuals will become even more educated. To find more conclusive answers about the effects of educational expansion on the dispersion of education, I regressed the average years of schooling into the standard deviation in schooling using the data for children's education for the 148 countries of the GDIM.

Figure 5 plots the observed values of educational attainment and standard deviation for the 148 economies in blue dots and the predicted values in a red fitted line, presenting in this way the relationship between the expansion and dispersion of schooling. The graph reveals an inverted-U-shaped association between average years of schooling and standard deviation in education, thus confirming the existence of the education Kuznets Curve: the dispersion in education increases as average years of schooling rise, reaching a peak at around 6–7 years; then dispersion begins to decrease, as average schooling rises even further.²⁸

Figure 5: Education Kuznets Curve



Source: Author's own compilation based on GDIM.

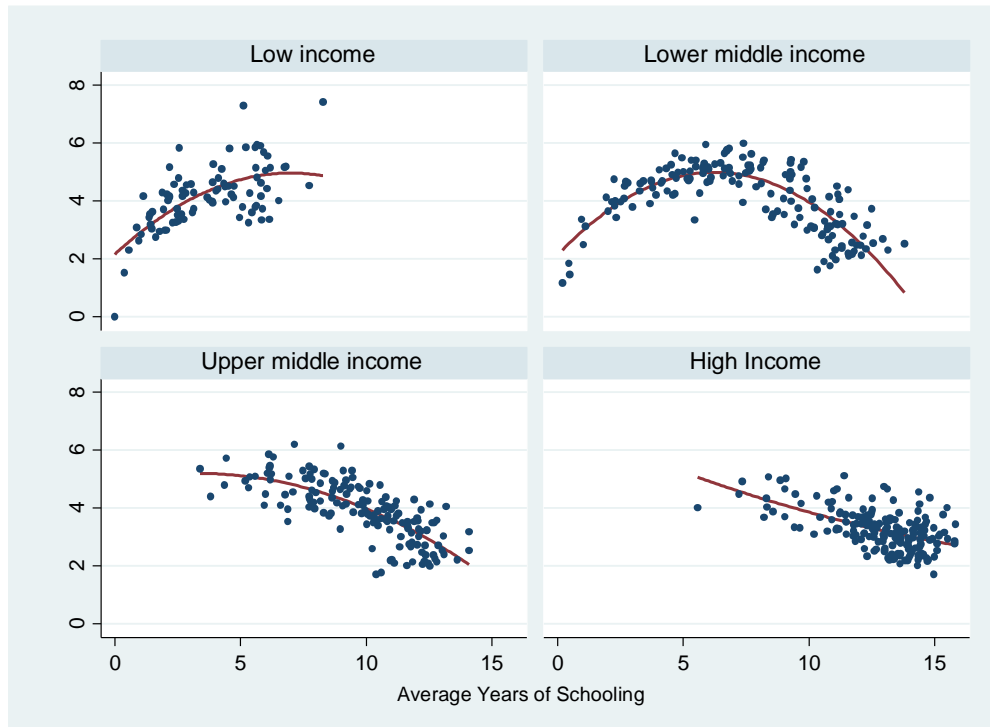
Note: Estimations for children's generation (boys and girls).

Meschi and Scervini (2013), Gregorio and Lee (2002), and Thomas et al. (1999) come to similar results in their studies. They use the introduction and subsequent expansion of compulsory schooling to explain the association between years of schooling and dispersion in education. In the initial phase of economic development, countries are incapable of achieving a universalization

²⁸ The original Kuznets Curve was established in the mid-1960s by Simon Kuznets to illustrate the relationship between income per capita and inequality during the economic development of countries. According to him, income inequality tends to be low in the early phases of economic development, and it will rise as countries experience increasing levels of income. But, after a certain point of development, further increases in average incomes would be associated with declining inequality. At the start of the 1990s, the Kuznets Curve was employed to highlight the relationship between expansion of schooling and inequality in educational attainment. See Acemoglu and Robinson (2002), Nielsen and Alderson (1997), and Ram (1990) for a more complete overview of the Kuznets Curve.

of education and the schooling gap between poor and rich families increases. However, as the income level in the countries rises, significantly higher performance in terms of net enrolment ratio can be reached. To emphasise the importance of economic development for the results of the Kuznets Curve, figure 6 plots the same relationship between the expansion of schooling and education dispersion divided by income levels. The results show that the estimated fitting curves present different slopes and directions among the income groups.

Figure 6: Education Kuznets Curve, by income level



Source: Author's own compilation based on GDIM.

Note: Estimations for children's generation (boys and girls).

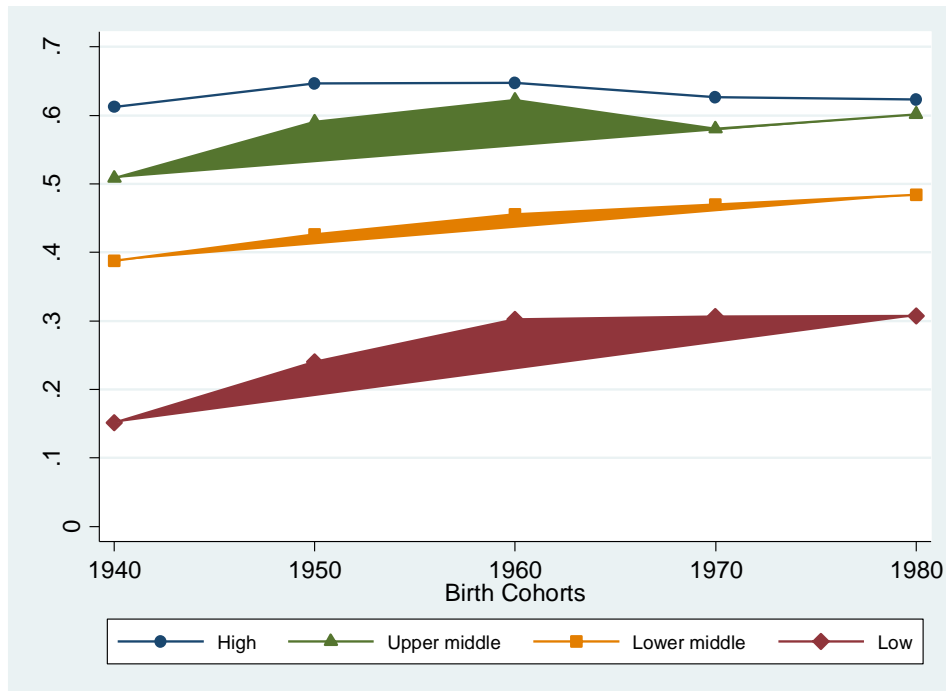
In poor countries, a low level of schooling is associated with relatively equal school attainment; as the number of years of schooling increases, the values of dispersion in education also rise. For the low-income nations we can visualise only the initial stage of an inverted-U-shaped curve. Seemingly, these countries have achieved the peak of standard deviation in schooling (note that the curve has become flat) – therefore, a further improvement in schooling will be probably accompanied by a reduction in the standard deviation. If this trend is confirmed, then the shape of the curve in the following decades will become very similar to the association with lower middle-income countries, where a clear inverted-U-shaped curve can be verified. By contrast, countries with upper-middle- and high-income levels have long since moved beyond the phase of increasing dispersion in educational attainment, providing in this way only the second part of the inverted-U-shaped curve.

Transition matrix

Figures 7 and 8 summarize graphically the most important results of intergenerational education mobility derived from Equation 3. To this end, firstly, the 5 x 5 transition matrices of educational outcomes for the 148 countries and the five birth cohorts were calculated separately. After that,

the next step was the estimation of the mobility indexes from these matrices. Figure 7 shows the first mobility index from the transition matrices divided by income levels and birth cohorts. The indicator “upward mobility” presents the share of children that have attained a higher educational level than their parents.

Figure 7: Upward mobility in education



Source: Author's own compilation based on GDIM.

Notes: Upward mobility shows the proportion of children who achieved a higher educational level than their (better-educated) parents, or a tertiary education, in the case that the parents already have a university degree. Average values are unweighted by countries' populations.

As described in detail by Narayan et al. (2018), the measure of upward mobility can be impacted by a “ceiling effect”. This is an estimation inaccuracy that occurs when the highest educational level is already reached. Within the applied methodological approach, children from parents with a college degree cannot achieve a higher level of education than their parents (the top category of the schooling classification is already tertiary education), so it is expected that the rate of upward mobility will be lower in countries with a higher proportion of parents with a college degree.²⁹ To deal with this ceiling effect, this paper assumes as indicative of upward mobility also children from parents with a tertiary education who have themselves achieved a university degree.³⁰

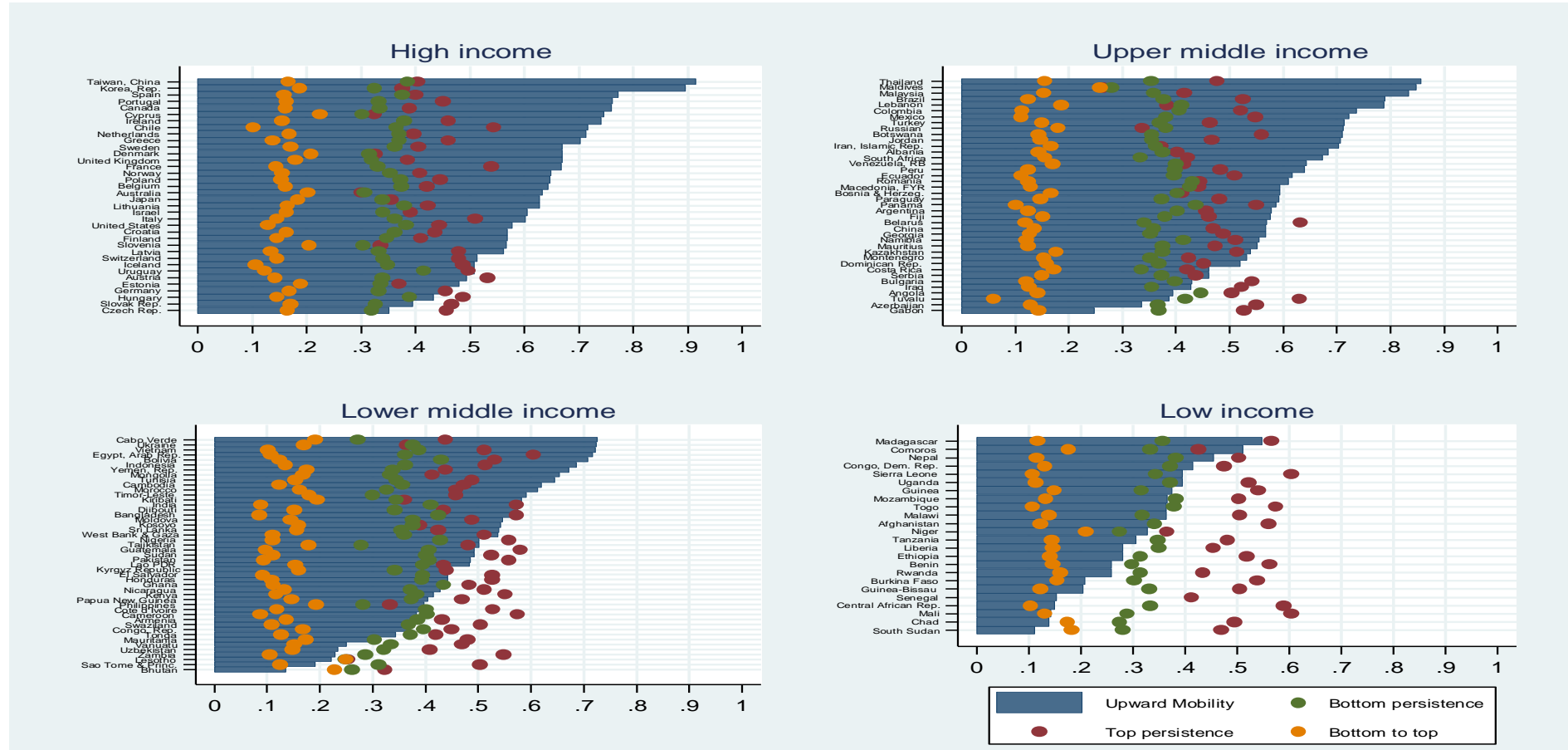
Children born in high-income countries have a greater chance to achieve intergenerational upward mobility, and this fact did not change in the last five decades. It is even possible to observe a decrease in the difference of (upward) mobility between rich and poor economies; however, this evolution was not sufficient to close the gap between them. Approximately six out of every 10 individuals born between 1980 and 1989 in countries with a high- and upper middle-income level have achieved a higher education level than their parents, while this proportion stands at three out of 10 for the low-income nations.

²⁹ More specifically, in the hypothetical case that all parents have a tertiary education, no children have a chance of upward mobility.

³⁰ Briefly and only for reasons of emphasis: upward mobility shows the proportion of children who achieved a higher educational level than their parents; or the same level, in the case that the parents have a university degree.

Figure 8 shows another aspect of intergenerational education mobility: besides the previously mentioned upward mobility, it shows the indicators “bottom persistence”, “top persistence” and “bottom to top” for individuals born between 1980 and 1989. The top persistence gives us an idea about the lack of mobility at the upper end of the educational distribution, showing the share of individuals from parents with a tertiary education who have also concluded the education system with a university degree. While the bottom persistence indicates such a process occurring at the low end of the scale, presenting the proportion of children who did not complete primary school and were born from parents with no (primary) education diploma, the bottom to top presents the most ambitious objective of mobility: the chances of children born into families with no educational attainment to achieve a tertiary education (Smeeding et al. 2011; Heineck and Riphahn 2009).

Figure 8: Intergenerational mobility indexes (1980s cohort)



Source: Author's own compilation based on GDIM.

Notes: Upward mobility represents the share of individuals with a higher education level than their (better-educated) parents, or a tertiary education, in the cases that the parents already have a university degree. The top (bottom) persistence displays the share of descendants from parents with tertiary (no primary) education who reached the same education level as their parents. Bottom to top is the percentage of children from parents with no primary education degree that have achieved a college degree.

It comes as no surprise that the lowest rates of intergenerational upward mobility are found in several low-income countries. In South Sudan, for example, only 11 percent of individuals have reached a higher level of education than their parents. The figures are 13 percent for Bhutan, 14 percent for Chad and Mali, and 15 percent for Senegal and Central African Republic. In order to understand this phenomenon, it is important to consider these findings together with the results from figures 1 and 2. As already mentioned previously, a considerable proportion of the population from the poorest countries has not completed primary education. Considering all the birth cohorts, the share of individuals with no school certificate is, for example, 83 percent in Chad and 82 percent in South Sudan. Given that the probability of achieving the completion of even basic educational levels remains very low in these countries, the chances of mobility are practically non-existent.

However, the opposite situation can be found in countries such as Madagascar and Comoros, which are also low-income countries but who have achieved a level of upward mobility higher than 50 percent (55 and 51 percent) – similar to the values of highly developed countries such as Switzerland and Iceland (both 51 percent). Madagascar and Comoros are examples of countries with a strong increase in average schooling over time. In Madagascar, for example, the share of individuals with no completed primary education in the parent generation was 62 percent while it decreased to 34 percent in the generation of the children.

The top persistence rate, also called in the literature the “intergenerational privilege rate”, is on average greater in low-income countries (51 percent, compared to 47 percent for middle-income and 42 percent for high-income ones). In Mali and Sierra Leone, for example, 60 percent of children from parents with a tertiary education have attained a college degree, while this rate is 30 percent in Australia. For an in-depth understanding of this “privilege”, it is interesting to analyse the top persistence rate in connection with the overall level of education in the countries under study. In Mali and Sierra Leone, only around three percent of parents have a tertiary education, while in Australia the rate is 66 percent. The average probability of a child born in Mali between 1980 and 1989 becoming a graduate is 5.5 percent, while the same chance is 52.8 percent in Australia. But, if this child from Mali has a parent with a tertiary education then their likelihood of attaining a university degree increases to 60.4 percent – higher than in countries such as Australia (30.0 percent), Denmark (32.7 percent), Japan (35.4 percent) or Norway (40.8 percent). This comparison indicates that the intergenerational transmission of privileges is particularly strong in least-developed countries.

The variation in the values for the other two mobility indicators has been much smaller around the world. Comparing the data for the 148 countries, the bottom persistence rate ranges from 25 percent in Lesotho to 45 percent in Senegal, and the bottom to the top rate between six percent in Tuvalu to 26 percent in the Maldives.³¹ In about one-half of all investigated countries the percentage of children from parents with no primary education who have achieved a college degree does not exceed 14.5 percent; among the 50 countries with the lowest bottom to top rate, only four are high-income economies (Chile, Iceland, Uruguay and the USA).

³¹ The average bottom persistence rate is 33 percent for low-income countries, 36 percent for lower middle-, 38 percent for upper middle- and 35 percent for high-income ones, while the bottom to top rate is 14 percent for low- and middle-income and 16 percent for high-income levels.

Intergenerational persistence in education

Figure 9 presents the worldwide variation in intergenerational persistence in education, measured by the regression coefficient from Equation 4 for young adults born in the 1980s. In this heat map, the lighter the shaded areas, the lower the level of persistence in educational attainment rates across generations, meaning the higher the mobility level.

The Maldives (0.109), Lesotho (0.147) and the Philippines (0.149) are the countries with the lowest association between children's and parent's years of schooling, while Guatemala (0.708), Benin (0.745) and Burkina Faso (0.836) are at the other extreme. Taking into account geographic location, countries from sub-Saharan Africa lead the ranking of persistence in educational attainment. Eight of the 10 countries (and 12 of the 20) with the lowest levels of IGM are found in this region of the world.³²

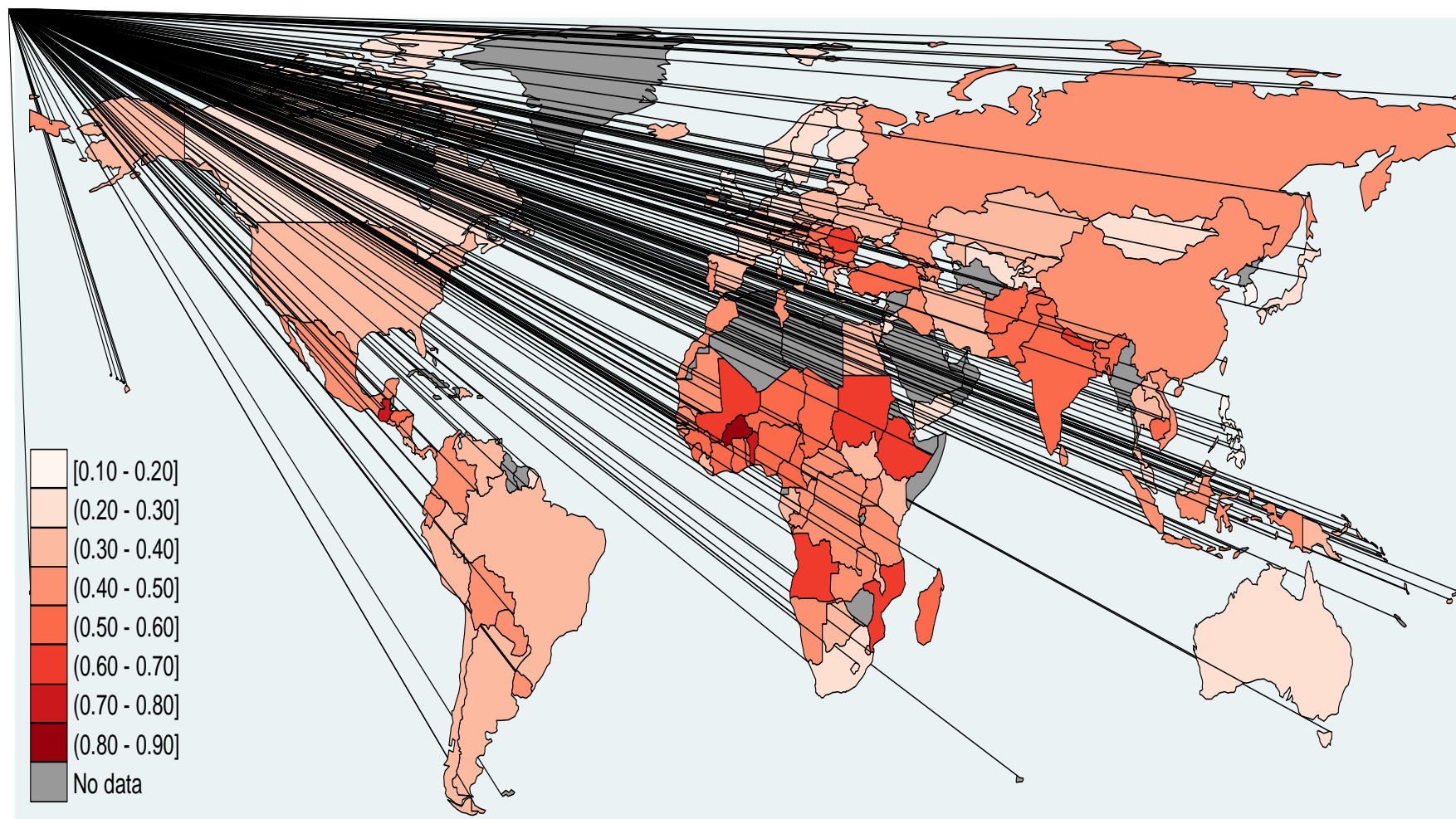
In addition to the sub-Saharan African countries, the top 20 countries vis-à-vis intergenerational immobility in education also include four countries from South Asia (Nepal, Bhutan, Bangladesh and India), two from Europe and Central Asia (Romania and Turkey), one from Latin America and the Caribbean (Guatemala), and one from Central Europe (Hungary). On the other hand, countries from Western Europe have hogged the majority of high-ranking places in IGM.³³ Although the three countries with the lowest intergenerational persistence in education are developing economies, the list of the top 30 in mobility is dominated by high-income economies (18 of the 30).³⁴

³² The countries from sub-Saharan Africa in the top 20 for persistence in education are respectively: Burkina Faso (0.836), Benin (0.745), Mali (0.680), Ethiopia (0.661), Angola (0.647), Sudan (0.645), Comoros (0.615), Mozambique (0.613), Cameroon (0.596), Cote d'Ivoire (0.595), Sao Tome and Principe (0.582), and Togo (0.578).

³³ There are 11 countries from Western Europe in the top 30 for intergenerational educational mobility: the United Kingdom (0.174), Denmark (0.200), Finland (0.239), Sweden (0.256), France (0.257), the Netherlands (0.271), Norway (0.272), Germany (0.286), Spain (0.307), Belgium (0.308) and Greece (0.316).

³⁴ In addition to the 11 Western Europe nations already mentioned, South Korea (0.186), Israel (0.191), Cyprus (0.204), Australia (0.231), Canada (0.260), Japan (0.286) and Lithuania (0.298) are the other countries with high income levels that compose the top 30 of worldwide mobility. The other economies in this list have a middle-income level: the Maldives (0.109), Lesotho (0.147), the Philippines (0.149), South Africa (0.205), Uzbekistan (0.217), Kiribati (0.230), Tajikistan (0.232), Jordan (0.241), Mongolia (0.245), Malaysia (0.293), Yemen (0.300) and Belarus (0.317).

Figure 9: Intergenerational persistence in education (1980s cohort)

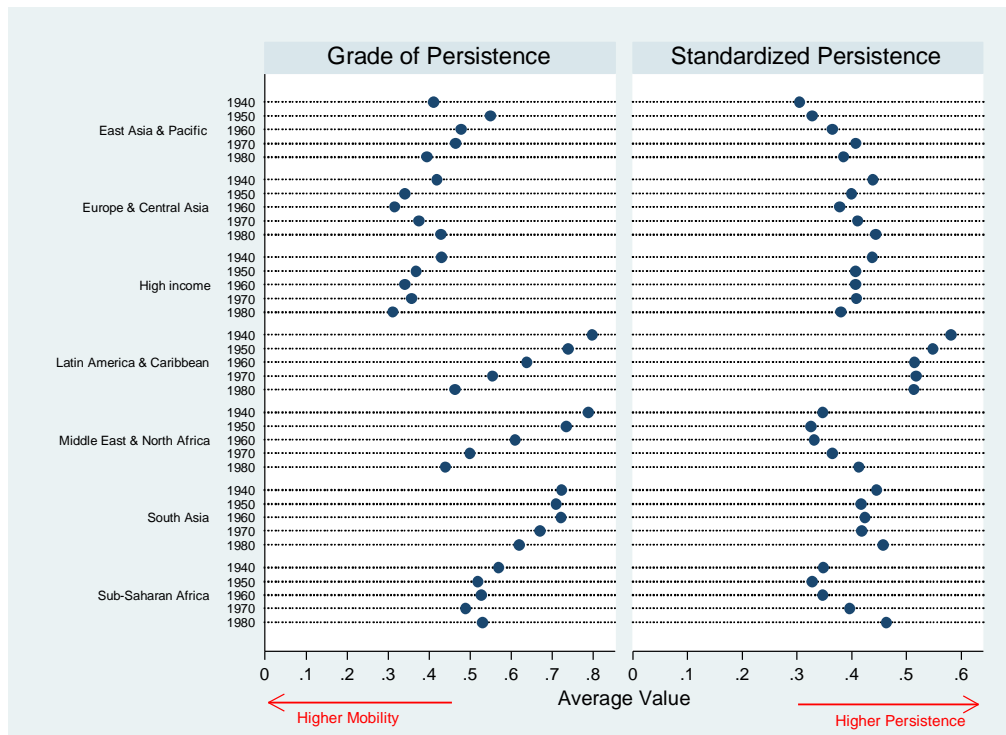


Source: Author's own compilation based on GDIM.

Notes: Estimations based on OLS regressions using years of schooling of children and their (better-educated) parents. The lighter the colour of the map, the lower the persistence in education across generations (or the higher the level of mobility).

Figure 10 facilitates the visualisation of the geographic differences in mobility, presenting the results of the grade of persistence (β) and standardized persistence (ρ) divided by world regions and birth cohorts. The first thing that can be observed in the graph is the different variations of (β) and (ρ) over time.³⁵ This finding does not constitute a surprise, given that the evolution of the regression coefficient is affected by the variation in standard deviation in schooling across parents' and children's generations; and, as shown in figures 4 and 5, the regions of the world are at different stages of educational outcomes. In some countries, universal primary education has been a reality for many decades now while in other places of the world it is still a target to be achieved. This difference in dispersion of education had a strong effect for the estimations of the standardized persistence in Equation 5.

Figure 10: Regression and correlation coefficients



Source: Author's own compilation based on GDIM.

Notes: Estimations using years of schooling of children and their (better-educated) parents. Average values are unweighted by countries' population.

Countries from South Asia, for example, display a significant increase in the average years of schooling over time, leading to an increase in the general level of education in society and consequently to a strong reduction of the regression coefficient. This is due to the fact that the majority of children have achieved a higher level of schooling than their parents.³⁶ However, when we exclude this elevator effect from the investigation of mobility, then it is possible to observe that the association between the schooling of children and parents in South Asia has remained almost constant over the last 50 years.

³⁵ The average values of the regression coefficients range between 0.798 (1940s cohort in Latin America and the Caribbean) and 0.312 (1980s cohort in high-income countries), while the correlation coefficients present a lower volatility (from 0.581 in Latin America and the Caribbean and 0.305 in East Asia and the Pacific, both figures relating to the 1940s cohort).

³⁶ As shown in figure 3, in South Asia the difference in average years of schooling between parents and children increased from one year in the 1940s cohort to three years in the 1980s one.

For a better understanding of this relationship, we can take as an example the results of Rwanda and France for the 1940s cohort. Both countries present a very similar level of intergenerational education mobility measured by the regression coefficient (respectively 0.494 and 0.524). These values mean, for example, that in both countries if individuals born between 1940 and 1949 had two years more schooling than their generational average, their children would have on average around one year more of schooling than their own peers.

However, in France the dispersion in educational attainment is very similar for the generations of parents and children (respectively 4.14 and 4.19 years) and, consequently, the correlation coefficient achieves a very similar value to the regression one (0.519 and 0.524). In the case of Rwanda, however, the standard deviation in the generation of parents for the selected cohort is 1.7 years and it increases to 2.9 years in the generation of children, because the increase of years of schooling was followed by a rise in inequality in schooling (as shown in the upper-left quadrant of figure 6). Hence when we exclude from the investigation of mobility the changes in education dispersion over time, we find that the correlation coefficient in Rwanda (0.287) is much smaller than in France (0.518). In practical terms, these results point to the fact that the chances of achieving a higher educational outcome from one generation to the next in France are nearly two times larger than in Rwanda.

Following this explanation of the methodological approaches for the estimations of the grade of persistence and standardized persistence, this section now aims to identify possible patterns in these two important indicators of mobility. First, we can observe diverging trends between world regions in the evolution over time of the regression coefficient (β): Latin America and the Caribbean as well as the Middle East and North Africa both had a constant and strong reduction in the estimations of β . In South Asia, sub-Saharan Africa and in high-income countries, the regression coefficients have also decreased – albeit on a much smaller scale, and in a non-continuous manner. The average values of the persistence in education remained stable for the 1940s and 1980s cohorts in countries from East Asia and the Pacific and Europe and Central Asia, meanwhile.

However, the estimations of the correlation coefficient (ρ) show that the divergence in mobility tends to be much smaller when we take into account the variation in the standard deviation of schooling across generations.³⁷ The estimated parameter ρ had a constant negative evolution between the 1940s and 1980s cohorts only in high-income countries and Latin America and the Caribbean. Countries from South Asia and from Europe and Central Asia presented practically the same standardized persistence for the 1940s and 1980s cohorts. Yet worse findings were uncovered for sub-Saharan Africa, the Middle East and North Africa, and East Asia and the Pacific. In these regions, the correlation coefficient (ρ) presented a steady and worrying increase over the last five decades; or, in other words, the chances to move up the economic ladder became lower for the younger generations than for their predecessors.

In this context, it is important to link the findings of standardized persistence with the empirical evidence from figure 3. Note that sub-Saharan Africa, the Middle East and North Africa, and East Asia and the Pacific were also regions with relatively strong improvement over time in the educational attainment for both generations: the average years of schooling of children in sub-

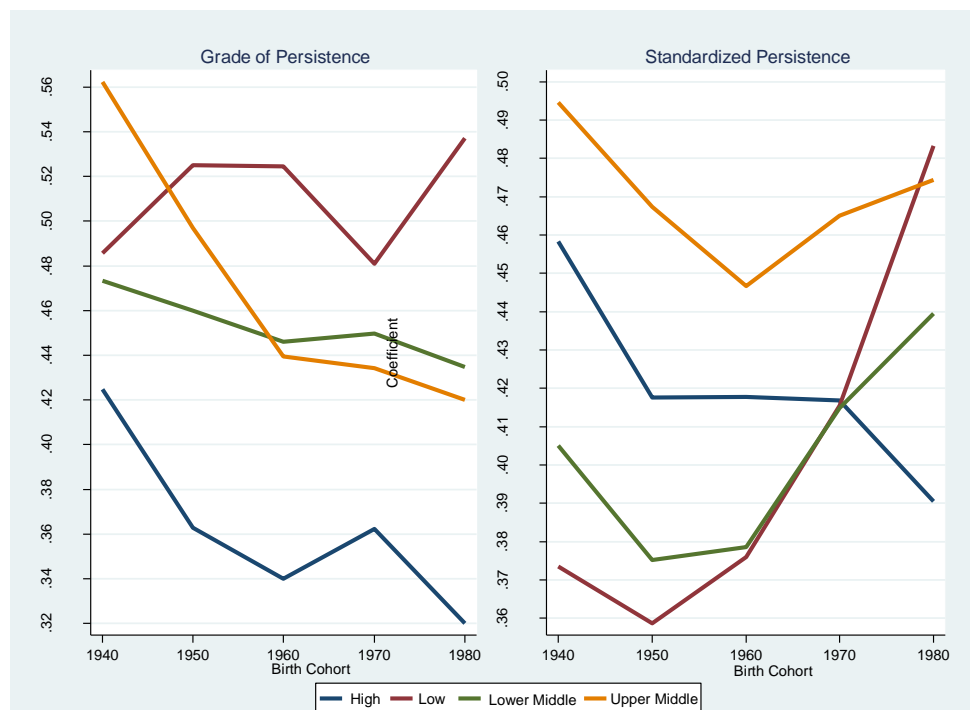
³⁷ Using empirical data for 42 countries, the renowned study of Hertz et al. (2007) come to similar findings, showing that the regression coefficients are much more volatile than the correlation ones.

Saharan Africa, for example, increased from 2.4 in the 1940s cohort to 6.4 in the 1980s cohort (an increase of 160 percent). Indeed, the data from the GDIM confirm the above by revealing that the increase in the average educational attainment in these world regions has been followed by a reduction in the chances of mobility.

Figure 10 allows us also to identify the most recent gap in intergenerational educational mobility across different regions of the world. The average values of ρ for the individuals born between 1980 and 1989 show that despite the positive evolution of mobility in Latin America and the Caribbean, the countries from this region continue to present the strongest association in education across generations (0.496). They are followed respectively by sub-Saharan Africa (0.474), South Asia (0.454), Europe and Central Asia (0.452), the Middle East and North Africa (0.412), high-income countries (0.390) and East Asia and the Pacific (0.389).

Figure 11 provides the same mobility indicators as figure 10, but this time divided by countries' income levels. Note that the average value of the correlation coefficient (ρ) for the individuals born between 1980 and 1989 is 0.390 for high-income economies, 0.425 for lower middle-, 0.466 for upper middle- and 0.490 for low-income countries. This indicates that the chances of mobility are rather low in the poorest countries of the world.

Figure 11: Evolution of persistence in schooling, by income level



Source: Author's own compilation based on GDIM.

Notes: Estimations using years of schooling of children and their (better-educated) parents. Average values are unweighted by countries' population.

The analysis of the development of the correlation coefficient across the 10-year cohorts in figure 11 conveys an even more worrying scenario regarding the low-income countries. Whereas the standardized persistence across generations decreased between 1940 and 1989 in the upper middle- and high-income countries, this coefficient has increased in low and lower-middle income economies. In both groups we can observe an upward trend in the correlation coefficient from the 1950s onwards, but the growth was still stronger in the countries with low income. In other words, it means that individuals born in low and lower-middle income countries from the year 1950 onwards have on average a lower chance of achieving intergenerational mobility than previous generations.

Conclusions

The recent publication of the Global Database of Intergenerational Mobility made possible for the first time presenting a detailed picture of intergenerational educational mobility around the world. Taking a global view, this paper has used results from transition matrix and intergenerational regression model approaches to compare the level of persistence in educational attainment between children and their parents for 148 countries – in the process covering in total around 96 percent of the world's population. The GDIM enabled me to investigate the global variation in educational attainment. Although the empirical results indicated strong differences in educational attainments across world regions currently, some positive trends could be identified: in the last five decades, there was in all regions of the world a constant increase in the average years of schooling, accompanied by a constant reduction of the difference in years of schooling among individuals from the same birth cohort.

The results concerning educational mobility presented in this paper are robust, and point to three principal conclusions. First, the likelihood of achieving intergenerational (upward) mobility in education, meaning the probability of offspring attaining a higher level of education than their parents, is distributed very unevenly around the world. This chance for children born in the 1980s ranges between 11 percent in South Sudan and 92 percent in Taiwan. In this context, it is important to note the positive association between mobility and income level: in countries with high- and upper middle-income levels, the chances to climb the education ladder are on average two times higher than in low-income nations; this situation has practically remained stable over the last few decades.

The second compelling body of empirical evidence from this study is the intergenerational transmission of “privileges”. In the least-developed countries, offspring born into families with a college degree have a greater chance to become graduates than their peers from the most-developed countries. The likelihood of children born between 1980 and 1989 attaining a higher education degree is, for example, five percent in Mali and 53 percent in Australia. However, if a child in Mali is born into a family with a tertiary education level, then their chances increase to 60 percent and become larger than those of their Australian counterpart.

Finally, this paper investigated the evolution over time of the persistence in education using estimations of regression and correlation coefficients. The findings from the grade of persistence analysis pointed to an increase in the mobility gap between poor and rich countries during the last 50 years. The exclusion of variation in standard deviation in schooling over time revealed an even more worrying scenario for countries with low income levels: the association in education between parents and children, measured by standardized persistence, has grown strongly since

1950 in the poorest countries of the world. Especially in sub-Saharan Africa, the Middle East and North Africa, and East Asia and the Pacific, the younger generations have a considerably lower chance of moving up the economic ladder than their predecessors.

Despite these important empirical findings, we have to note the methodological limitations of this paper. First, as discussed in the second section, the database did not allow me to measure the quality of schooling. As the quality of education varies widely across countries, the years of schooling tends to be an imperfect proxy for skill levels, creating in this way a distortion in the results of comparative studies on mobility. Results from the PISA exam, a comparative data study on 15 year olds' performance in reading, mathematics and science, point to a large discrepancy in the proficiency scores across the 80 investigated countries.³⁸ Further research might then take into account the quality of schooling by the measurement of mobility, given that not only the final educational outcome but also the level of cognitive abilities acquired at the school has a significant impact on the future economic performance of children.

The second constraint concerns the investigation of mobility for a “relatively young” population. This paper provided compelling results for the temporal evolution of intergenerational educational mobility. However, because the GDIM used only individuals with completed educational attainment at the time of survey, it was not possible to present empirical evidence for the population born after the 1990s. The World Bank study points to a strong growth in the net enrolment rates for individuals born in the 1990s or later in some regions of the world, particularly in sub-Saharan Africa and South Asia (Narayan et al. 2018). Therefore, it is reasonable to expect that this recent development will have a significant impact on the chances of mobility.

Another important issue is that for methodological reasons this study has focused on providing empirical evidence of IGM in educational attainment at an aggregate level so as to help us understand trends and patterns around the world, closing a research gap that has existed for years. Although methodologically challenging, it could be beneficial to use the worldwide results of mobility presented in this paper as the basis for conducting more in-depth explorations of the main causal mechanisms affecting its variation across the globe.³⁹ When discussing the causal factors determining IGM, it is essential to keep in mind the fundamental institutions which are interacting and determining the extent to which family economic background might be translated into economic outcomes of offspring: the market, the family and the state (Corak 2013).

This study has shown, among other things, that educational mobility and GDP are positively correlated, given that the persistence in schooling between parents and children tends to be lower in high-income economies. However, the empirical evidence makes clear that GDP alone cannot explain the variation in mobility. Countries with very diverse socioeconomic patterns can achieve similar levels of intergenerational education mobility, as in the case of Germany, Nepal and Kyrgyzstan, where 45 percent of children born between 1980 and 1989 achieved upward mobility, or Comoros, Switzerland and Dominican Republic where this coefficient is around 51 percent. In this way, more comparative studies are needed to explore and identify possible similarities across countries and concerning the institutions and mechanisms related to the transmission of education outcomes across generations.

³⁸ See Bautier and Rayou (2007) regarding the variation in PISA results across countries.

³⁹ See Chetty et al. (2014a) and Björklund and Jäntti (2009) for a detailed discussion of the methodological difficulties faced in the empirical investigation of causality within the intergenerational framework.

Last but certainly not least, the results from this paper highlight the urgent need to investigate in more detail the recent development of educational attainment in the least-developed countries of the world. Although the average years of schooling for individuals born in low-income nations increased 145 percent between 1940 and 1989 (from two to almost five years), the association in education level between children and parents became stronger. This indicates that the chances to move up the economic ladder from one generation to the next declined sharply over the time period considered. Given that this evolution goes against the overall worldwide trend, it is necessary to understand why the positive evolution of education was accompanied by a decrease in the chance of mobility in these particular countries.

Appendix Table

Measures of intergenerational educational mobility (1980s cohort)

Country	Obs.	Transition Matrix				Linear Regression Model	
		Upward Mobility	Top persistence	Bottom persistence	Bottom to top	Regression Coefficient	Correlation Coefficient
Afghanistan	3,956	0.342	0.561	0.342	0.123	0.526	0.544
Albania	513	0.684	0.403	0.375	0.144	0.398	0.441
Angola	459	0.396	0.503	0.448	0.141	0.647	0.745
Argentina	1,567	0.579	0.455	0.402	0.124	0.341	0.239
Armenia	426	0.382	0.432	0.385	0.136	0.482	0.495
Australia	2,843	0.633	0.300	0.305	0.201	0.231	0.217
Austria	669	0.496	0.532	0.339	0.142	0.441	0.425
Azerbaijan	592	0.335	0.549	0.366	0.128	0.412	0.376
Bangladesh	1,606	0.563	0.573	0.423	0.085	0.583	0.592
Belarus	458	0.568	0.633	0.341	0.119	0.317	0.253
Belgium	640	0.645	0.421	0.372	0.160	0.308	0.195
Benin	9,161	0.261	0.563	0.298	0.145	0.745	0.977
Bhutan	1,430	0.136	0.323	0.261	0.229	0.599	1.121
Bolivia	1,891	0.709	0.532	0.429	0.123	0.434	0.341
Bosnia and Herzegovina	484	0.593	0.410	0.403	0.167	0.446	0.446
Botswana	372	0.712	0.559	0.356	0.143	0.330	0.235
Brazil	6,164	0.790	0.525	0.376	0.124	0.348	0.263
Bulgaria	445	0.430	0.542	0.397	0.121	0.573	0.498
Burkina Faso	892	0.210	0.538	0.303	0.155	0.836	1.134
Cabo Verde	433	0.727	0.438	0.271	0.190	0.417	0.480
Cambodia	872	0.620	0.473	0.356	0.123	0.547	0.697
Cameroon	591	0.384	0.575	0.402	0.088	0.596	0.585
Canada	3,305	0.762	0.389	0.333	0.162	0.260	0.213
Central African Republic	266	0.151	0.589	0.333	0.105	0.468	0.408
Chad	562	0.141	0.494	0.275	0.175	0.551	0.648
Chile	12,720	0.718	0.544	0.365	0.102	0.374	0.278
China	5,788	0.568	0.470	0.359	0.136	0.483	0.506
Colombia	8,478	0.737	0.522	0.406	0.113	0.468	0.399
Comoros	368	0.513	0.426	0.333	0.178	0.615	0.953
Congo, Dem. Rep.	13,642	0.415	0.475	0.371	0.131	0.482	0.520
Congo, Rep.	331	0.367	0.450	0.398	0.168	0.491	0.489
Costa Rica	1,369	0.463	0.420	0.335	0.172	0.347	0.310
Cote d'Ivoire	1,085	0.396	0.527	0.401	0.119	0.595	0.668
Croatia	363	0.568	0.436	0.361	0.164	0.450	0.392
Cyprus	398	0.745	0.324	0.302	0.224	0.204	0.161
Czech Republic	902	0.350	0.457	0.319	0.165	0.373	0.365
Denmark	519	0.671	0.327	0.315	0.207	0.200	0.236
Djibouti	991	0.575	0.435	0.342	0.151	0.415	0.480
Dominican Republic	1,259	0.519	0.453	0.367	0.159	0.339	0.275
Ecuador	13,457	0.619	0.508	0.395	0.112	0.493	0.455

Overcoming Inequalities in a Fractured World
Occasional Paper 2

Egypt, Arab Rep.	9,808	0.717	0.605	0.361	0.106	0.394	0.327
El Salvador	1,394	0.442	0.527	0.395	0.092	0.438	0.402
Estonia	767	0.479	0.371	0.335	0.189	0.319	0.318
Ethiopia	3,353	0.281	0.518	0.315	0.140	0.661	0.812
Fiji	584	0.577	0.461	0.381	0.153	0.389	0.411
Finland	760	0.567	0.409	0.347	0.146	0.239	0.187
France	583	0.670	0.538	0.329	0.144	0.257	0.167
Gabon	323	0.247	0.526	0.368	0.144	0.371	0.312
Georgia	351	0.566	0.487	0.352	0.128	0.449	0.412
Germany	996	0.451	0.456	0.332	0.168	0.286	0.257
Ghana	8,583	0.440	0.483	0.434	0.113	0.526	0.491
Greece	218	0.703	0.461	0.369	0.136	0.316	0.204
Guatemala	6,893	0.495	0.580	0.406	0.097	0.708	0.830
Guinea	942	0.377	0.540	0.316	0.150	0.557	0.661
Guinea-Bissau	413	0.205	0.505	0.331	0.122	0.495	0.520
Honduras	1,634	0.441	0.527	0.393	0.109	0.574	0.618
Hungary	481	0.432	0.487	0.388	0.146	0.590	0.549
Iceland	114	0.508	0.487	0.349	0.105	0.319	0.265
India	27,571	0.580	0.572	0.409	0.089	0.576	0.597
Indonesia	7,084	0.687	0.514	0.362	0.135	0.416	0.353
Iran, Islamic Rep.	8,131	0.703	0.370	0.363	0.166	0.341	0.280
Iraq	25,505	0.428	0.522	0.355	0.126	0.490	0.509
Ireland	1,065	0.741	0.461	0.378	0.153	0.377	0.293
Israel	1,100	0.607	0.390	0.340	0.163	0.191	0.091
Italy	332	0.603	0.508	0.361	0.145	0.331	0.246
Japan	380	0.630	0.354	0.338	0.184	0.286	0.268
Jordan	4,450	0.707	0.467	0.354	0.146	0.241	0.147
Kazakhstan	445	0.538	0.515	0.374	0.176	0.333	0.284
Kenya	1,654	0.415	0.551	0.383	0.118	0.359	0.273
Kiribati	197	0.582	0.360	0.346	0.194	0.230	0.181
Korea, Rep.	2,042	0.897	0.375	0.324	0.186	0.186	0.099
Kosovo	652	0.543	0.390	0.375	0.160	0.391	0.413
Kyrgyz Republic	561	0.447	0.440	0.342	0.160	0.360	0.317
Lao PDR	475	0.484	0.435	0.394	0.154	0.393	0.361
Latvia	284	0.563	0.479	0.332	0.134	0.387	0.390
Lebanon	465	0.788	0.383	0.410	0.186	0.450	0.438
Lesotho	602	0.224	0.254	0.249	0.250	0.147	0.845
Liberia	2,169	0.282	0.454	0.350	0.145	0.369	0.339
Lithuania	574	0.629	0.422	0.379	0.164	0.298	0.225
Macedonia, FYR	470	0.596	0.442	0.426	0.129	0.524	0.504
Madagascar	5,662	0.548	0.565	0.357	0.117	0.563	0.564
Malawi	2,327	0.365	0.506	0.318	0.139	0.371	0.314
Malaysia	7,311	0.833	0.415	0.359	0.154	0.293	0.209
Maldives	460	0.850	0.266	0.279	0.258	0.109	0.083
Mali	3,880	0.144	0.604	0.290	0.131	0.680	0.761
Mauritania	1,673	0.308	0.479	0.303	0.173	0.427	0.474
Mauritius	1,091	0.552	0.473	0.375	0.124	0.378	0.310
Mexico	7,926	0.722	0.548	0.381	0.112	0.404	0.325
Moldova	349	0.547	0.489	0.375	0.145	0.472	0.478
Mongolia	540	0.653	0.414	0.332	0.168	0.245	0.198

Intergenerational Mobility in Education: Estimates of the Worldwide Variation
Tharcisio Leone

Montenegro	562	0.533	0.424	0.352	0.153	0.540	0.549
Morocco	5,528	0.614	0.458	0.327	0.163	0.469	0.572
Mozambique	464	0.366	0.505	0.381	0.133	0.613	0.731
Namibia	651	0.556	0.511	0.413	0.121	0.488	0.433
Nepal	3,799	0.454	0.503	0.382	0.114	0.612	0.774
Netherlands	553	0.714	0.396	0.370	0.169	0.271	0.194
Nicaragua	1,491	0.430	0.512	0.371	0.134	0.433	0.405
Niger	2,740	0.329	0.366	0.274	0.210	0.523	0.647
Nigeria	3,630	0.503	0.558	0.428	0.111	0.558	0.549
Norway	571	0.651	0.408	0.352	0.153	0.272	0.267
Pakistan	4,468	0.484	0.558	0.407	0.094	0.560	0.566
Panama	3,273	0.585	0.549	0.437	0.100	0.477	0.371
Papua New Guinea	622	0.405	0.469	0.373	0.145	0.369	0.386
Paraguay	1,773	0.591	0.480	0.373	0.146	0.402	0.366
Peru	2,334	0.642	0.482	0.397	0.124	0.395	0.307
Philippines	8,252	0.396	0.333	0.282	0.193	0.149	0.135
Poland	869	0.648	0.445	0.372	0.152	0.339	0.253
Portugal	564	0.764	0.450	0.332	0.163	0.463	0.539
Romania	316	0.610	0.444	0.432	0.123	0.689	0.762
Russian Federation	780	0.714	0.338	0.382	0.181	0.415	0.366
Rwanda	1,242	0.260	0.435	0.315	0.160	0.507	0.584
Sao Tome and Principe	131	0.190	0.503	0.312	0.124	0.582	0.755
Senegal	1,437	0.154	0.414	.	.	0.452	0.457
Serbia	489	0.462	0.436	0.372	0.150	0.447	0.417
Sierra Leone	637	0.397	0.604	0.344	0.108	0.532	0.540
Slovak Republic	460	0.396	0.465	0.327	0.170	0.390	0.361
Slovenia	521	0.567	0.336	0.304	0.205	0.327	0.347
South Africa	4,113	0.673	0.421	0.335	0.155	0.205	0.116
South Sudan	514	0.111	0.469	0.280	0.182	0.320	0.267
Spain	790	0.771	0.399	0.376	0.157	0.307	0.221
Sri Lanka	570	0.540	0.423	0.355	0.157	0.407	0.339
Sudan	1,311	0.494	0.525	0.402	0.113	0.645	0.772
Swaziland	191	0.381	0.505	0.369	0.108	0.381	0.280
Sweden	598	0.671	0.404	0.361	0.170	0.256	0.169
Switzerland	554	0.515	0.479	0.341	0.145	0.371	0.350
Taiwan Province of China	605	0.916	0.403	0.386	0.166	0.341	0.260
Tajikistan	541	0.503	0.481	0.279	0.178	0.232	0.179
Tanzania	3,065	0.307	0.482	0.347	0.144	0.442	0.430
Thailand	2,603	0.856	0.477	0.353	0.155	0.356	0.286
Timor-Leste	2,853	0.593	0.457	0.300	0.181	0.521	0.919
Togo	1,363	0.365	0.575	0.379	0.108	0.578	0.601
Tonga	255	0.343	0.420	0.371	0.126	0.324	0.391
Tunisia	1,838	0.644	0.489	0.345	0.152	0.403	0.396
Turkey	735	0.714	0.463	0.369	0.151	0.576	0.653
Tuvalu	64	0.387	0.630	0.417	0.061	0.370	0.233
Uganda	1,020	0.395	0.521	0.371	0.113	0.438	0.385
Ukraine	590	0.724	0.364	0.376	0.170	0.386	0.367
United Kingdom	542	0.670	0.386	0.320	0.178	0.174	0.110

Overcoming Inequalities in a Fractured World
Occasional Paper 2

United States	3,660	0.578	0.444	0.382	0.128	0.328	0.261
Uruguay	1,241	0.508	0.498	0.415	0.123	0.455	0.391
Uzbekistan	601	0.234	0.408	0.321	0.147	0.217	0.174
Vanuatu	513	0.250	0.469	0.334	0.151	0.368	0.326
Venezuela, RB	1,496	0.644	0.412	0.399	0.170	0.335	0.281
Vietnam	617	0.721	0.511	0.388	0.101	0.474	0.437
West Bank and Gaza	1,071	0.537	0.512	0.359	0.110	0.375	0.349
Yemen, Rep.	2,774	0.671	0.438	0.337	0.174	0.300	0.262
Zambia	2,596	0.228	0.547	0.286	0.106	0.418	0.558

Source: Author's own compilation based on GDIM-2018.

Note: Estimations based on the schooling of all children (boys and girls) and their most educated parent.

References

- Aaberge, Rolf, Anders Björklund, Markus Jäntti, Mårten Palme, Peder J. Pedersen, Nina Smith, and Tom Wennemo. 2002. "Income inequality and income mobility in the Scandinavian countries compared to the United States." *Review of Income and Wealth*, 48(4):443-469.
- Aaronson, Daniel and Bhashkar Mazumder. 2008. "Intergenerational economic mobility in the United States, 1940 to 2000." *Journal of Human Resources*, 43(1):139-172.
- Acemoglu, Daron and James A. Robinson. 2002. "The political economy of the Kuznets curve." *Review of development economics*, 6(2):183-203.
- Altham, Patricia M. and Joseph P. Ferrie. 2007. "Comparing contingency tables tools for analyzing data from two groups cross-classified by two characteristics." *Historical Methods: A Journal of Quantitative and Interdisciplinary History*, 40(1):3-16.
- Arifin, Muhammad Husni. 2017. "The role of higher education in promoting social mobility in Indonesia." *European Journal of Multidisciplinary Studies*, 6(1):233-241.
- Ayala, Luis and Mercedes Sastre. 2008. "The structure of income mobility: empirical evidence from five UE countries." *Empirical Economics*, 35(3):451-473.
- Aydemir, Abdurrahman, Wen-Hao Chen, and Miles Corak. 2013. "Intergenerational education mobility among the children of Canadian immigrants." *Canadian Public Policy*, 39(Supplement 1):S107-S122.
- Azam, Mehtabul and Vipul Bhatt. 2015. "Like father, like son? Intergenerational educational mobility in India." *Demography*, 52(6):1929-1959.
- Bautier, Elizaebth and Patrick Rayou. 2007. "What PISA really evaluates: literacy or students' universes of reference?" *Journal of Educational Change*, 8(4):359-364.
- Bazzi, Marco, Francisco Blasques, Siem Jan Koopman, and Andre Lucas. 2017. "Time-varying transition probabilities for Markov regime switching models." *Journal of Time Series Analysis*, 38(3):458-478.
- Becker, Gary S. and Nigel Tomes. 1979. "An equilibrium theory of the distribution of income and intergenerational mobility." *Journal of Political Economy*, 87(6):1153-1189.
- Becker, Gary S. and Nigel Tomes. 1986. "Human capital and the rise and fall of families." *Journal of Labor Economics*, 4(3, Part 2):S1-S39.
- Behrman, Jere R., Nancy Birdsall, and Miguel Szekely. 1999. *Intergenerational mobility in Latin America: Deeper markets and better schools make a difference*. Volume No. 3. Carnegie Endowment for International Peace, Global Policy Program.
- Björklund, Anders and Markus Jäntti. 2009. "Intergenerational income mobility and the role of family background." In *Oxford Handbook of Economic Inequality*, edited by Wiemer Salverda, Brian Nolan, and Timothy M. Smeeding, 491-521. Oxford: Oxford University Press.

- Black, Sandra E. and Paul Devereux. 2010. *Recent developments in intergenerational mobility*. NBER: Working Paper No. 15889. Cambridge, MA, USA: National Bureau of Economic Research.
- Blanden, Jo. 2013. "Cross-country rankings in intergenerational mobility: A comparison of approaches from economics and sociology." *Journal of Economic Surveys*, 27(1):38-73.
- Blanden, Jo and Lindsey Macmillan. 2011. "Recent developments in intergenerational mobility." In *The Labour Market in Winter: The State of Working Britain*, edited by Paul Gregg and Jonathan Wadsworth, 190-202. New York: Oxford University Press.
- Blanden, Jo and Lindsey Macmillan. 2014. *Education and intergenerational mobility: Help or hindrance?* SPCC: Working Paper No.8. London: Social Policy in a Cold Climate, Centre for Analysis of Social Exclusion, The London School of Economics and Political Science.
- Bourguignon, François, Francisco H. Ferreira, and Marta Menéndez. 2007. "Inequality of opportunity in Brazil." *Review of Income and Wealth*, 53(4): 585-618.
- Bratberg, Espen, Jonathan Davis, Bhashkar Mazumder, Martin Nybom, Daniel D. Schnitzlein, and Kjell Vaage. 2017. "A comparison of intergenerational mobility curves in Germany, Norway, Sweden, and the US." *The Scandinavian Journal of Economics*, 119(1):72-101.
- Breen, Richard, and Kristian Bernt Karlson. 2013. "Education and social mobility: New analytical approaches." *European Sociological Review*, 30(1):107-118.
- Card, David. 1999. "The causal effect of education on earnings." In *Handbook of Labor Economics: Volume 3*, edited by Orley Ashenfelter, Richard Layard and David Card, 1801-1863. Amsterdam: Elsevier Science B.V.
- Cecchi, Daniele, Carlo V. Fiorio, and Marco Leonardi. 2013. "Intergenerational persistence of educational attainment in Italy." *Economics Letters*, 118(1):229-232.
- Chetty, Raj, Nathaniel Hendren, Patrick Kline, and Emmanuel Saez. 2014a. "Where is the land of opportunity? The geography of intergenerational mobility in the United States." *The Quarterly Journal of Economics*, 129(4):1553-1623.
- Chetty, Raj, Nathaniel Hendren, Patrick Kline, Emmanuel Saez, and Nicholas Turner. 2014b. "Is the United States still a land of opportunity? Recent trends in intergenerational mobility." *American Economic Review*, 104(5):141-47.
- Corak, Miles. 2004. "Generational income mobility in North America and Europe: An introduction." In *Generational income mobility in North America and Europe* edited by Miles Corak, 1-38. Cambridge, UK: Cambridge University Press.
- Corak, Miles. 2006. "Do poor children become poor adults? Lessons from a cross-country comparison of generational earnings mobility." In *Dynamics of Inequality and Poverty*, edited by John Creedy and Guyonne Kalb, 143-188. Bingley: Emerald Group Publishing Limited.
- Corak, Miles. 2013. "Income inequality, equality of opportunity, and intergenerational mobility." *Journal of Economic Perspectives*, 27(3):79-102.

- Corak, Miles, Matthew J. Lindquist, and Bhashkar Mazumder. 2014. "A comparison of upward and downward intergenerational mobility in Canada, Sweden and the United States." *Labour Economics*, 30:185-200.
- Corneo, Giacomo. 2015. "Income inequality from a lifetime perspective." *Empirica* 42(2):225-239.
- Cunha, Flavio, and James Heckman. 2007. "The technology of skill formation". *American Economic Review*, 97(2):31-47.
- Daouli, Joan, Michael Demoussis, and Nicholas Giannakopoulos. 2010. "Mothers, fathers and daughters: Intergenerational transmission of education in Greece." *Economics of Education Review*, 29(1):83-93.
- Daude, Christian. 2011. *Ascendance by descendants? On intergenerational education mobility in Latin America*. OECD: Working Paper No. 297. Paris, Organization for Economic Cooperation and Development.
- De Maio, Fernando G. 2007. "Income inequality measures." *Journal of Epidemiology & Community Health*, 61(10):849-852.
- Dorfman, Robert. 1979. "A formula for the GINI coefficient." *The Review of Economics and Statistics*, 61(1):146-149.
- Duncan, Greg, Ariel Kalil, Susan E. Mayer, Robin Tepper, and Monique R. Payne. 2005. "The apple does not fall far from the tree." In *Unequal Chances: Family Background and Economic Success*, edited by Samuel Bowles, Herbert Gintis, and Melissa Osborne Groves, 23-79. Princeton: Princeton University Press.
- Ferreira, Sergio Guimaraes, and Fernando A. Veloso. 2006. "Intergenerational mobility of wages in Brazil." *Brazilian Review of Econometrics*, 26(2):181-211.
- Fox, Liana, Florence Torche, and Jane Waldfogel. 2016. "Intergenerational mobility." In *The Oxford Handbook of the Social Science of Poverty*, edited by David Brady and Linda M. Burton, 528-555. New York: Oxford University Press.
- Ganzeboom, Harry B., and Paul Nieuwbeerta. 1999. "Access to education in six Eastern European countries between 1940 and 1985. Results of a cross-national survey." *Communist and Post-Communist Studies*, 32(4):339-357.
- Gregg, Paul, and Lindsey Macmillan. 2010. "Family income, education and cognitive ability in the next generation: Exploring income gradients in education and test scores for current cohorts of youth." *Longitudinal and Life Course Studies*, 1(3):259-280.
- Gregorio, Jose De, and Jong-Wha Lee. 2002. "Education and income inequality: new evidence from cross-country data." *Review of Income and Wealth*, 48(3):395-416.
- Guner, Nezih. 2015. "Gary Becker's legacy on intergenerational mobility." *Journal of Demographic Economics*, 81(1):33-43.
- Haveman, Robert, and Timothy Smeeding. 2006. "The role of higher education in social mobility." *The Future of Children*, 16(2):125-150.

- Heckman, James J., John Eric Humphries, and Gregory Veramendi. 2016. "Returns to education: The causal effects of education on earnings, health and smoking." *Journal of Political Economy*, 126(1): 197-S246.
- Heckman, James J., Lance J. Lochner and Petra E. Todd. 2006. "Earnings functions, rates of return and treatment effects: The mincer equation and beyond." In *Handbook of the Economics of Education: Volume 1*, edited by Erik A. Hanushek and Finis Welsh, 307-458. Amsterdam: North Holland.
- Heineck, Guido, and Regina T. Riphahn. 2009. "Intergenerational transmission of educational attainment in Germany - The last five decades." *Jahrbücher für Nationalökonomie und Statistik*, 229(1):36-60.
- Hertz, Tom. 2007. "Trends in the intergenerational elasticity of family income in the United States." *Industrial Relations: A Journal of Economy and Society*, 46(1):22-50.
- Hertz, Tom, Tamara Jayasundera, Patrizio Piraino, Sibel Selcuk, Nicole Smith, and Alina Verashchagina. 2007. "The inheritance of educational inequality: International comparisons and fifty-year trends." *The BE Journal of Economic Analysis & Policy*, 7(2):1-46.
- Jantti, Markus, Bernt Bratsberg, Knut Roed, Oddbjorn Raaum, Robin Naylor, Eva Osterbacka, Anders Bjorklund, and Tor Eriksson. 2006. *American exceptionalism in a new light: A comparison of intergenerational earnings mobility in the Nordic countries, the United Kingdom and the United States*. IZA: Discussion Paper No. 1938. Bonn, Institute for the Study of Labor.
- Jäntti, M. and Jenkins, S. P. 2015. "Income mobility." In *Handbook of Income Distribution: Volume 2*, edited by Anthony B. Atkinson and François Bourguignon, 807-935. Amsterdam: North Holland.
- Lee, Chul-In, and Gary Solon. 2009. "Trends in intergenerational income mobility." *The Review of Economics and Statistics*, 91(4):766-772.
- Long, Jason, and Joseph Ferrie. 2013. "Intergenerational occupational mobility in Great Britain and the United States since 1850." *American Economic Review*, 103(4):1109-1137.
- Matras, Judah. 1961. "Differential fertility, intergenerational occupational mobility, and change in the occupational distribution: Some elementary interrelationships." *Population Studies*, 15(2):187-197.
- Mazumder, Bhashkar. 2005. "The apple falls even closer to the tree than we thought: New and revised estimates of the intergenerational inheritance of earnings." In *Unequal Chances: Family Background and Economic Success*, edited by Samuel Bowles, Herbert Gintis, and Melissa Osborne Groves, 80-99. Princeton: Princeton University Press.
- Mazumder, Bhashkar. 2016. "Estimating the intergenerational elasticity and rank association in the United States: Overcoming the current limitations of tax data." In *Inequality: Causes and Consequences*, edited by Lorenzo Cappellari, Solomon W. Polachek, and Konstantinos Tatsiramos, 83-129. Bingley: Emerald Group Publishing.

- Meschi, Elena, and Francesco Scervini. 2013. "Expansion of schooling and educational inequality in Europe: the educational Kuznets curve revisited." *Oxford Economic Papers*, 66(3):660-680.
- Narayan, Ambar, Roy Van der Weide, Alexandru Cojocaru, Christoph Lakner, Silvia Redaelli, Daniel Gerszon Mahler, Rakesh Gupta N. Ramasubbaiah, and Stefan Thewissen. 2018. *Fair progress?: Economic mobility across generations around the World. Equity and Development*. Washington, DC: World Bank Publications.
- Neidhöfer, Guido, Joaquín Serrano, and Leonardo Gasparini. 2018. "Educational inequality and intergenerational mobility in Latin America: A new database." *Journal of Development Economics*, 134:329-349.
- Nielsen, Francois, and Arthur S. Alderson. 1997. "The Kuznets curve and the great U-turn: income inequality in US counties, 1970 to 1990." *American Sociological Review*, 62(1):12-33.
- Nybom, Martin, and Jan Stuhler. 2017. "Biases in standard measures of intergenerational income dependence." *Journal of Human Resources*, 52(3):800-825.
- Obama, Barack. 2013. Remarks by the president on economic mobility. The White House: Office of the Press Secretary Washington. Accessed 19 September 2018. <https://obamawhitehouse.archives.gov/the-press-office/2013/12/04/remarks-president-economic-mobility>
- Piketty, Thomas. 2000. "Theories of persistent inequality and intergenerational mobility." In *Handbook of Income Distribution: Volume 1*, edited by Anthony B. Atkinson and François Bourguignon, 429-476. Amsterdam: North Holland.
- Plewis, Ian, and Mel Bartley. 2014. "Intra-generational social mobility and educational qualifications." *Research in Social Stratification and Mobility*, 36:1-11.
- Psacharopoulos, George and Harry A. Patrinos. 2004. "Returns to investment in education: a further update." *Education economics*, 12(2):111-134.
- Rawls, John. 1971. *A Theory of Justice*. Cambridge, USA: Harvard University Press.
- Ram, Rati. 1990. "Educational expansion and schooling inequality: International evidence and some implications." *The Review of Economics and Statistics*, 72(2):266-274.
- Roemer, John E., and Burak Ünveren. 2017. "Dynamic equality of opportunity." *Economica*, 84(334):322-343.
- Rousseff, D. 2011. Speech by President Dilma Rousseff to Congress on the occasion of her inauguration - Brasilia, January 1st, 2011. Brazilian Ministry of Foreign Affairs. Accessed 05 September 2018. <http://www.itamaraty.gov.br/en/speeches-articles-and-interviews/president-of-the-federative-republic-of-brazil-speeches/4661-address-of-dilma-vana-rousseff-president-of-the-republic-inaugural-speech-to-congress-english-version>

- Smeeding, Timothy, Robert Erikson, and Markus Jäntti. 2011. *Persistence, privilege, and parenting: The comparative study of intergenerational mobility*. New York: Russell Sage Foundation.
- Solon, Gary. 1992. "Intergenerational income mobility in the United States." *The American Economic Review*, 82(3):393-408.
- Tamborini, Christopher R., ChangHwan Kim, and Arthur Sakamoto. 2015. "Education and lifetime earnings in the United States." *Demography*, 52(4):1383-1407.
- Thomas, Vinod, Yan Wang, and Xibo Fan. 1999. *Measuring education inequality: Gini coefficients of education*. Washington DC: World Bank Publications.
- Torche, Florencia. 2014. "Intergenerational mobility and inequality: The Latin American case." *Annual Review of Sociology*, 40:619-642.
- Torul, Orhan, and Oguz Oztunali. 2017. *Intergenerational educational mobility in Europe*. Working Paper No. 2017/03, Bogazici University, Department of Economics.
- UNESCO (United Nations Educational, Scientific and Cultural Organization). 2003. *International Standard Classification of Education (ISCED), 1997*. Montreal: UNESCO Institute for Statistics.
- Van de Gaer, Dirk, Erik Schokkaert, and Michel Martinez. 2001. "Three meanings of intergenerational mobility." *Economica*, 68(272):519-538.
- World Bank. 2018. *World development report 2018: Learning to realize education's promise*. Washington, DC: The World Bank.
- Young, Michael. 2017. *The rise of the meritocracy*. New York: Routledge.
- Zimmerman, David J. 1992. "Regression toward mediocrity in economic stature." *The American Economic Review*, 82(3):409-429.