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The relationship between contextual characteristics and the intergenerational correlation of education in developing countries

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ABSTRACT

We investigate the importance of contextual variables in explaining the differences in the correlation of education from parents to children in 48 developing countries. The contextual characteristics are internationally comparable macro-economic and institutional indicators. We use measures on GDP and industrial development, public spending, the education system, infrastructure, health outcomes, political stability and accountability. Our results show that contextual characteristics account for 39% of the explained cross-country variation in the education correlation across generations. The quality of the education system is the most important explanation of the variation of the intergenerational education correlation in the developing countries.

1. Introduction

Over the last five decades, studies have garnered evidence on the extent and determinants of social mobility, more specifically on the association between occupational class or the educational attainment of the parents and that of their children. In social mobility research, the status attainment model of [Blau and Duncan \(1967\)](#) is considered as a milestone. This model links the inequalities in educational attainment and the subsequent inequalities in occupational status of individuals to inequalities in the background of their families. However, a reduction in the effect of family background on individual status attainment over time due to increased access to better quality education is tenable. Research that has shed light on how macro-structural variables, for instance, gross domestic product per capita (GDP per capita), education expenditure, education expansion, health condition and political ideology shape social mobility, supports the status attainment model ([Akbulut-Yuksel and Turan, 2013](#); [Ballarino et al., 2009](#); [Bauer and Riphahn, 2013](#); [Sieben and De Graff, 2001](#); [Van Doorn et al., 2011](#)). These variables underlie the relationship between parental educational attainment and that of their children. For clarity purposes, educational mobility is the opposite of educational transmission or persistence. While with educational transmission or persistence, the inequalities in educational attainment of parents replicate to their children, educational mobility is the non-replication of parental educational

attainment ([Hertz et al., 2008](#)).

In this study, we present a comparative analysis of the impact of contextual characteristics, i.e. macro-structural variables, on the intergenerational correlation of education. We do not seek to establish a causal relationship between parents' education and children's education. We focus on intergenerational association or correlation given that there exists many potential inputs, besides what we consider in this paper, that causally relates parents' education to children's education ([Holmlund et al., 2011](#)). The contextual characteristics referred to here can be broadly defined as the macro-economic factors of countries. The study builds on [Van Doorn et al. \(2011\)](#), which advanced the findings of the effect of contextual characteristics on education transmission. Their comparative analysis suggested that contextual variables play a key role in shaping the patterns of intergenerational education transmission in different societies. [Van Doorn et al. \(2011\)](#) simultaneously examined the effect of multiple contextual characteristics on the intergenerational transmission of educational attainment using cross-national data for European countries. Hence, their conclusion is drawn from a multi-contextual (utilizing multiple contextual variables) and multi-societal (across multiple countries) perspective. However, their study was carried out within the context of developed countries. To the best of our knowledge, our study is the first to analyze the multi-contextual and multi-societal variation of intergenerational correlation of education in developing countries.

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We thus extend the cross-national comparative analysis about origin-destination of educational attainment in industrialized contexts to the developing countries. The relevance and importance of this research is the testing of the existence of possible systematic differences across developing countries and the impact of variation in access to education on these differences. Research on the impact of contextual factors on the intergenerational correlation of educational attainment is important as it sheds light on how to strengthen the macroeconomic context by increasing standards of living and strengthening governance and how the institutional context may increase social mobility and weaken the intergenerational correlation of education. It shows how institutions affect social mobility through individual opportunities in education. This is useful given the weak position and large variation in education systems in many less developed countries and their lower levels of economic development. The need to increase educational attainment makes it important to analyze the relationship between the intergenerational correlation of education and social, economic, and demographic variables. It is considered to be the course to obtain more equal opportunities for children and higher productivity levels.

Barro and Lee (2013) suggested that developing countries may acquire advanced technology by investing in the skills levels of workers, by increasing their educational levels. Additional years of schooling provide a high rate of return, which has a positive influence on – among others – fertility, reduction of child mortality, and income distribution (Breierova and Duflo, 2004; Gregorio and Lee, 2002). This paper contributes to this literature by extending comparative studies. It does so by utilizing data from 48 developing countries. Therefore, conclusions are drawn about the intergenerational correlation of education for developing countries. The specific research question is: How do the contextual characteristics influence the variation in the relationship between education of parents and the educational attainment of their children? To better understand the cross-national variation in the correlation of parental education with children's education, we analyze the impact of macro-economic and institutional indicators. This paper uses data from the Demographic and Health Surveys (DHS) for 48 developing countries and figures on macro-economic and institutional indicators from the World Bank for these developing countries to answer this question.

We conduct the analysis in two stages. First, we estimate the intergenerational correlation of education in developing countries using micro-data from the DHS. Subsequently, we analyze the relationship between contextual characteristics taken from the World Bank and the transfer of education from parents to children by exploring the variation in the correlation coefficient obtained in the first stage. The macro-economic and institutional indicators include indicators of national income and public spending, the system of education, infrastructure, health outcomes, labor market, and governance institutions. The choice of the contextual variables is based on evidence from the existing literature, as well as data availability. It is worth noting that the contextual characteristics used here are macro level characteristics without incongruence in the coding of the data. Thus the same measurement and the same coding apply to all the countries, making it comparable. This is a requirement for carrying out this comparative analysis (Jonsson and Mills, 1993). We acknowledge that due to differences in industrial development, institutions and labor market conditions, country-specific data would contain incongruences that would prevent generalization from a mono-contextual to a multi-contextual perspective.

2. Determinants of educational transmission

2.1. Family background

Several studies have analyzed the intergenerational transmission of family background variables such as education and occupation of parents to that of their children (see Carvalho, 2012 and reference therein).

The family is the primary source of learning and socialization, which suggests that these qualities transmitted from parents to children are vital (Kovan et al., 2009). The intergenerational transmission of years of education attained by parents and that attained by their children is corroborated by evidence from both developed and developing countries and is explained by a range of potential avenues. From the literature it can be concluded that the persistence or immobility in education caused by family background is explained by two mechanisms, which allow children to inherit some fraction of their parents' human capital. These mechanisms include family wealth (Huang, 2013) and ability (Pfeffer, 2008).

Ability is transmitted from parents to children genetically (nature) or through parental care (nurture) (Plug and Vijverberg, 2003). Becker (2003) and Stocké (2007) argued that parents rely on their own educational experiences in decisions concerning education. This theory assumes that an important condition for success at all school levels is the strategic knowledge of parents as well as their social know-how, which are crucial sources of information liable to mediate part of the educational association between generations (Deil-Amen and Rosenbaum, 2003). With regards to family wealth, the approach put forward by the rational choice theory is that parents and children make decisions on education based on careful consideration of economic resources, weighing the costs and benefits concerning education and their alternatives (Breen and Goldthorpe, 1997).

2.2. Contextual forces and social mobility

Blau and Duncan (1967) stated that in industrialized countries, individual status attainment is more related to achievement than to ascription (social background). That is, a decrease in social mobility as a result of family conditions from birth (for instance, parent's occupation and education) in favor of social mobility stems from the influence of industrial and policy situations. In this regard, it is expected that a favorable contextual characteristic weakens the inheritance of educational attainment of the parents by the children.

2.2.1. Economic modernization driven by technological changes

The level of industrialization is one of the societal conditions used to examine the development in the resemblance in educational positions between parents and children in modern societies (Sieben and De Graff, 2001). According to the expectation, industrialization reduces the effect of social origin on educational attainment, or reduces the resemblance of educational attainment between generations in favor of inequality reduction and opportunity amelioration (Müller and Karle, 1993). Even though Müller and Karle (1993) found no negative influence of industrialization on the resemblance of educational attainment between generations in developed countries as expected, their finding are not dissimilar to that of Van Doorn et al. (2011). The latter found a weaker relationship between parents' and their children's educational achievements in highly industrialized countries.

The argument for the weakening of origin effect lies in the efficient use of labor, which is higher in more industrialized countries. We use the GDP per capita as a measure of industrialization. We also use fixed telephone subscriptions and mobile cellular subscriptions. Just like industrialization, fixed telephone subscriptions and mobile cellular subscriptions are proxies for the level of modernization in the society. The modernization theory stipulates that intergenerational transmission of education is reduced by a higher level of modernization (Sieben and De Graff, 2001). Here, we derive our hypothesis from the prediction of the modernization theory and we assume that fixed telephone subscriptions and mobile cellular subscriptions are part of the economic processes driven by technological change. In this light we advance the hypothesis that the relationship between the parents' education and children's education is weaker in higher levels of modernization (Hypothesis 1).

2.2.2. The educational system

Jonsson and Mills (1993) studied the effect of educational expansion in reducing inequalities in educational opportunities. Educational changes created more opportunities, which benefit less privileged children as well as increase their educational attainment and class transition. In other words, these changes lead to a reduction in the intergenerational transmission of education. The study of Kerckhoff (1995) confirms that changes in educational institutions serve as a pathway for the movement from origin to destination in the system of stratification as well as shaping the opportunity structure. The role of educational changes is to provide possible moves from one location (e.g. social class status) to another. Kerckhoff (1995) argued that the system of education has the ability to specify the strength of the relationship between family background and educational attainment.

In conclusion, better quality of education and the educational system reduces the strength between family background and educational attainment. That is, it leads to a reduction of the intergenerational transmission of education. This varies from one country to another depending on the differences in institutional settings (Ballarino et al., 2009). One argument forwarded to support the fact that family background loses its importance on status attainment in more modern societies, is that the expansion of educational systems makes individual educational careers longer, thereby affecting the importance of the family in educational careers negatively (Sieben and De Graff, 2001). Features of educational institutions considered in this paper include the pupil-teacher ratio in primary education, primary school starting age, primary school duration, secondary school duration, duration of compulsory education, and government expenditure on education. As a result, we have the following hypothesis: the relationship between parents' educational attainment on their children's educational attainment is weaker in countries with higher accessibility of the educational infrastructure (Hypothesis 2).

2.2.3. The labor market

Labor market institutions serve as a pathway between family and school, and shape the structure of education mobility (Kerckhoff, 1995). One such labor market circumstance is the female labor force participation rate. Traditionally, we place the effect of female employment as a complement to family background characteristics in influencing the education of children given that they, for instance, increase the financial provision for educational decisions. For instance, Kalmijn (1994) concluded that a higher educational achievement of children is positively influenced by higher occupational status of mothers, thereby weakening the effect of father's education. In the case of participation of women in the labor market as a macroeconomic characteristic, the interest is to test whether increasing women's participation in the labor market affects the relative father versus mother transmission rate, with possibly negative impact on the intergenerational transmission of education through family background (Van Doorn et al., 2011).

The expected negative effect of female participation in the labor force on educational transmission is based on the argument that the labor market provides external incentives that are not related to family background. These incentives are rather to motivate individuals towards attaining better education stemming from new occupational aspirations and female empowerment on becoming breadwinners (Van Doorn et al., 2011). Just like the assumption concerning the system of education, Kerckhoff (1995) concluded that labor market institutions have the ability to mediate the intergenerational transmission of education. This mediation is in the direction of a reduction of the effect of family background on educational attainment in case of a favorable system of the labor force. The feature of the labor market system included in this study is the ratio of the female to male labor force participation rate. We therefore expect that in countries with a higher ratio of the female to male labor force participation rate, the relationship between the educational level of the parents and the educational level

of the children is weaker (Hypothesis 3).

2.2.4. Adverse health effect

Akbulut-Yuksel and Turan (2013) investigated adverse health conditions as one of the potential underlying mechanisms affecting the transfer of status from one generation to the next. They proposed two mechanisms that explain how ill health affects education transmission. First, sick mothers may be unable to educate their children properly. Second, decisions concerning education may change as a result of the increased mortality risk not only for sick or infected parents, but also for non-infected parents in the community. Other studies have also documented the negative impact of, in this case, HIV/AIDS epidemic on educational attainment for both orphans (Evans and Miguel, 2007) and non-orphans (Fortson, 2011). We use life expectancy at birth and prevalence of HIV as measures of health. Therefore, our hypothesis is as follows: the higher the level of ill-health the weaker the intergenerational correlation of education (Hypothesis 4).

2.2.5. Characteristics of institutions

Research has examined how contextual characteristics, including state policies and global forces, shape educational stratification through their effects on the demand for education or the structure and supply of schooling. Sieben and De Graff (2001) argued that characteristics of the institutions (state) are important factors in explaining cross-country differences in status attainment. It has been established that systems with less corruption, and more voice and accountability as well as good governance for the citizens, build trust and the willingness to contribute and corporate (Bird et al., 2008). We therefore assume that more provision of opportunities and freedom to partake reduces the intergenerational transmission of education. In this sub-section, we also include contextual characteristics that have not been documented in the literature in this field of study. These are the extent of voice and accountability, the extent of corruption, and the extent of political stability. The hypothesis is: More positive state characteristic weakens the correlation of education across generations (Hypothesis 5).

2.2.6. Other factors

There are a number of other contextual factors that have been used in research to explain the evolution of the origin-status relationship, which we will not include in this paper. For instance, Sieben and De Graff (2001) studied inequalities in family background and inequalities in educational attainment while testing the socialist ideology hypothesis. This is a measure of the political circumstance of a country. Their socialist ideology hypothesis is that social-democratic and communist societies reduce the family background effect on educational achievement through social reforms.

3. Data

3.1. Data description

We conduct the analysis using the DHS data for 48 developing countries from 149 surveys conducted between the years 1990 and 2014. The countries that are included in this data are listed in Appendix A. The surveys are nationally representative, comparable across countries and give information on households including personal, household, and residential characteristics (Rutstein and Rojas, 2006). The data are collected using standard model questionnaires, and by identifying eligible respondents of the households for interview. Both variables of interest, parent's education and child's education are provided. For the purpose of this paper, in households with both parents present, the education of the parent with the highest level of education is considered. Where both parents present have the same level of education, the head of the house's education is retained.

The distribution is truncated to children aged 20–30 as to ensure that we include a generation who has (relatively) recently completed

formal education at the time of survey. There is a potential problem of a downward biased education transmission coefficient that may arise from the lower limit. This is as a result of the exclusion of children who still need to complete their final educational levels and those who take longer time than usual to complete their final studies. With the 20–30 years truncation, we assume the bias from this problem to be fairly small, as ascertained by Hertz et al. (2008). The decision with regards to the upper limit is in consideration of the possibility of an upward bias of the mean level and a downward education transmission coefficient bias for the relatively older children. This possibility arises because education may be correlated with longevity (Hertz et al., 2008).

The educational process is considered in this study as unitary, given that the purpose is to determine how country characteristics influence the relationship between educational achievements of parents and their children. As such, we consider the education completed in single years. Data on 305,416 parents and 406,253 children are included after deleting households with missing values on required variables. Sample sizes range from 337 (for Dominican Republic) to 10,340 (for Indonesia).

The sampling issue we face here is that the sample in the analysis is more representative of the parent-child sub-sample. Besides children, the original data include information on other individuals such as ‘other relative, not related, niece/nephew by blood, niece/nephew by marriage, son/daughter-in-law’. The estimated coefficients may be biased if any of these family members have an educational attainment which is significantly different from that of children. We can remedy the situation by including them as children who also lived in the household. However, we did not include them because they could be members who do not normally live in the household.

3.2. Descriptive statistics

Table 1 presents the descriptive statistics. Survey weights are used in all calculations to make surveys nationally representative. As seen from the table, children tend to be more educated than parents with an average of 8.38 years of education, which is larger than the 5.21 average years of education of parents. The dependent variable captures the number of years of schooling of the children while the major independent variable is the number of years of schooling of the parent. The control variables include individual characteristics, household characteristics, region of residence, and fixed effects of the year and country. The individual characteristics are the gender of parents, gender of the child, and the age of the child. Household characteristics are household wealth and the number of children aged 5 and below. Household wealth is organized into quintiles: richest, richer, middle, poorer, and poorest. The region of residence is split into rural region

Table 1
Descriptive statistics of the individual-level characteristics.

Generation	Variable	Mean	Standard deviation	Range
Parents	Parent education	5.21	4.98	0-24
	Number of children age ≤ 5	0.72	1.07	0-17
	Gender: Father(vs Mother)	0.77	0.42	0-1
	Rural region of residence(vs Urban)	0.55	0.50	0-1
	Wealth quintiles			
	Richest	0.25	0.43	0-1
	Richer	0.22	0.41	0-1
	Middle	0.20	0.40	0-1
	Poorer	0.18	0.38	0-1
	Poorest	0.16	0.36	0-1
Children	Child education	8.38	4.74	0-24
	Child age	23.46	2.96	20-30
	Child gender: Male (vs Female)	0.61	0.49	0-1

Notes: The household sampling weights are used to compute all statistics. $N_{\text{children}} = 406,253$; $N_{\text{parents}} = 305,416$.

and urban region.

In Table 2, the contextual variables and the dependent variable used in the second stage of the analysis are presented. The dependent variable in this table is the correlation coefficients between parents and children's education computed for each survey. Contextual characteristics are computed for each survey per country. We include GDP per capita (measured in constant 2010 US dollars) as an indicator of standard of living. Indicators used to determine the effect of the educational system include pupil-teacher ratio (average number of pupils per teacher), the government expenditure on education (% of GDP), primary school starting age, primary school duration (years), secondary school duration (years), and the compulsory years of education. We use fixed telephone subscriptions (per 100 people), and mobile cellular subscriptions (per 100 people) as measures of infrastructure. Life expectancy at birth (years) and prevalence of HIV (% of population ages 15–49) are used as indicators of health.

The ratio of female to male labor force participation rate (%) is used as an indicator of the efficiency of the labor market. Institutional effects are measured by three different estimates. These are the estimates of the extent of corruption, the extent of political stability, and the extent of voice and accountability for the citizens. They are given in units of distribution ranging from approximately -2.5 to 2.5 . All these variables are obtained from the World Bank (2017). One issue with the data collection is the existence of missing values, which are filled using cubic interpolation per country. Where there are no data, such as for Nigeria on government expenditure education and for Turkey on the prevalence of HIV indicator, the mean values of all countries were imputed for that.

4. Methodology

Our analysis is conducted in two stages. First, we estimate the intergenerational correlation of education in developing countries by pooling all surveys and countries (406,253 observations), and introducing fixed effects for countries and years (results in Table 3). Second, we examine how contextual characteristics affect the intergenerational correlation of education by running a set of linear regressions with the 149 surveys (results in Table 4), which are then used as the dependent variable to carry out linear regressions of the intergenerational education correlation (149 observations) on the contextual variables simultaneously (results in Table 5). We detail those steps next.

4.1. Intergenerational correlation of education

In line with Becker and Tomes (1986), we derive our equation for estimating a linear regression of years of education of children on years of education of parents,

$$E_{it} = a_0 + a_1 E_{it-1} + f(\text{Age}_{it}, \text{Gender}_{it}, \text{Gender}_{it-1}, \text{NC}, \text{RR}, \text{WQ}, \text{Country}, \text{Year}) + e_{it}, \quad (1)$$

where E_{it} is the education of the child i in generation t , E_{it-1} is the education of the parent i in generation $t-1$, $f(\text{Age}_{it}, \dots)$ denote the characteristics of children and parents we control for in the regression analysis. For this purpose, it and $t-1$ simply differentiates the information of the child from the information of the parent. The control variables are age of child, gender of child, gender of parent, number of children aged 5 or less (denoted by NC), region of residence (RR), wealth quintile (WQ), and country and year fixed effects. The latter captures the time-invariant heterogeneity across years and across countries. We control for the gender of the parent because we do not intend to compare the effect of parent education on child education by parent gender. We merely determine the average years of schooling of the child to be achieved following a year increase in the educational attainment of a parent. The econometric specification provides a measure of association indicating how an additional year of education of

Table 2
Descriptive statistics of the macro-level characteristics.

Variable	N	Mean	Standard deviation	Range
Education correlation coefficients (years)	149	0.27	0.08	0.10–0.50
Primary school pupil-teacher ratio(average)	149	40.28	13.94	15–79.27
Fixed telephone subscriptions (per 100 people)	149	3.36	4.96	0–28.69
GDP per capita (constant 2010 US\$)	149	1602.13	1738.68	196–10137
Government education expenditure (% of GDP)	149	4.29	4.71	1.07–44.33
Life expectancy at birth (years)	149	59.01	8.76	28.11–73.75
Mobile cellular subscriptions (per 100 people)	149	24.67	35.91	0–156.67
Prevalence of HIV(% of population ages 15–49)	149	3.88	5.36	0.10–23
Primary education duration (years)	149	5.87	0.77	3–7
Primary school starting age (years)	149	6.27	0.50	5–7
Female-male labor force participation rate (%)	149	73.62	21.67	15.88–108.20
Secondary education duration (years)	149	6.25	0.73	4–7
Compulsory education duration (years)	149	7.81	2.37	0–15
Corruption estimate	149	-0.68	0.44	-1.50–0.81
Political stability estimate	149	-0.63	0.75	-2.26–1.05
Voice and accountability estimate	149	-0.51	0.52	-1.67–0.50

the parent correlates with the education of the child. a_1 is the parameter of interest which indicates the association between parent's education and child's education, thus measuring the educational correlation between generations (Table 3).

4.2. The relationship between contextual characteristics and intergenerational correlation of education

In the second stage of the analysis, we measure the intergenerational correlation coefficient of education for each survey separately in the data, giving a total of 149 intergenerational correlation coefficients. In particular, we estimate for each survey the following regression model:

$$E_{it} = a_0 + a_1 E_{it-1} + f(\text{Age}_{it}, \text{Gender}_{it}, \text{Gender}_{it-1}, \text{NC}, \text{RR}, \text{WE}) + e_{it}, \quad (2)$$

We utilize these correlation coefficients (Table 4) as the dependent variable and estimate a linear regression with this dependent variable on the contextual variables,

$$\text{ITC}_{y,c} = b_0 + b_1 \text{CV}_{y,c} + e_{y,c}, \quad (3)$$

where ITC is the intergenerational education correlation of year y in country c , B_1 represents the relationship between intergenerational education correlation and contextual characteristics, and CV is the contextual characteristic of year y in country c . The GDP per capita is represented in thousand change by dividing the values by one thousand while the other independent variables are standardized (Table 5).

5. Results

To preview the result on the general association between parents' education and children's education at the micro level in developing economies, we estimate Eq. (1). The results, as presented in Table 3,

Table 3
Intergenerational education correlation, pooled estimates.

Child education	(1)			(2)		
	Coefficient	Standard error	P-value	Coefficient	Standard error	P-value
Parent's education	0.526	0.001	0.000**	0.390	0.002	0.000**
Control variables	No			Yes		
Adjusted R ²	0.3095			0.3897		
N	406,253			406,253		

Notes: We report robust standard errors in parentheses, clustered at the family level. The complete result is presented in Appendix B with the coefficients of the control variables.

indicate in column (1) an average association over all 48 countries in our sample of 0.53-year increase in children's years of schooling following an additional year of parent's education. This correlation reduces to 0.39-year in column (2), when we control for household characteristics and individual characteristics. These characteristics include wealth quintile, number of children aged 5 and below, parent's gender, child's gender and child's age. We also control for the region of residence as well as the fixed effects of year and country. This persistence in educational attainment of 0.39 in absolute terms is of a bit stronger magnitude than the one found by Akbulut-Yuksel and Turan, (2013) for Sub-Saharan Africa (0.20 years), confirming the existence of parent-child educational attainment persistence in developing countries.

Next, we estimate Eq. (2) for each of the 149 surveys for the 48 countries separately. This is presented in Table 4.

Table 4 presents the intergenerational correlation coefficients which serve as the dependent variable for the second stage of the analysis. From this parent-child educational association relationship across the developing countries, we find an average of 0.27 years of education. The correlation coefficients range from a weak value of 0.10 (Kyrgyz Republic) to a much stronger intergenerational correlation coefficient of 0.50 (Madagascar). The coefficients show irregularities in the within group variation over time, which decreases in the majority of countries. With the exception of Kyrgyz Republic, the within group variations are not substantial. The majority (44%) lie between 0.20–0.29, 29% between 0.30–0.39, 20% between 0.10–0.19 and 7% between 0.40–0.50.

The results of the estimation of Eq. (3) are presented in Table 5. It shows the regression estimates for the relationship between contextual characteristics and the intergenerational correlation coefficient of education. The four model specifications present the independent variables included in the analysis step-wise. This is done to observe inconsistencies in the magnitude of the relationship when measures of institutions and government policies are held fixed. There is no specific reason for the order of adding the variables. We, however, start with

Table 4

Intergenerational correlation of education coefficients.

	Armenia	Bangladesh	Benin	Bolivia	Burkina Faso	Cambodia	Cameroon	Chad	Colombia	Congo D. R.	Congo R.	Cote d'Ivoire	Dominican Republic	Egypt	Ethiopia	Gabon	Ghana	Guinea
1990									0.30									
1991							0.28											
1993		0.42		0.18	0.40							0.24					0.23	
1994									0.28					0.28				
1995		0.44	0.28	0.18	0.27		0.20	0.34				0.36	0.28				0.23	0.23
1998		0.33							0.33				0.30	0.22	0.30	0.17		
1999						0.29												
2000	0.34																	
2002													0.27					
2003				0.19	0.41			0.41							0.32			0.17
2004		0.34				0.31	0.28		0.27	0.14	0.34							
2005	0.33		0.29															
2006																		
2007									0.23					0.22			0.20	
2008				0.14		0.31	0.29			0.17	0.32				0.31	0.15		0.19
2010	0.44		0.26		0.34								0.23					
2011		0.35																
2012																		
2013																		
2014		0.35				0.28			0.26					0.27			0.20	

	Haiti	Honduras	Indonesia	Jordan	Kazakhstan	Kenya	Kyrgyz Republic	Lesotho	Madagascar	Malawi	Mali	Morocco	Mozambique	Namibia	Nepal	Nicaragua	Niger	Nigeria
1990																		0.27
1992										0.33		0.28		0.27				
1993						0.19												
1994	0.25										0.31							
1995					0.14										0.35			
1996																		
1997			0.38	0.21			0.10						0.35					
1998						0.20										0.26	0.32	
1999					0.20													
2000										0.40	0.37			0.21	0.30	0.27		
2001																		
2002			0.38									0.26	0.34					0.26
2003								0.36	0.50									
2004	0.22	0.33																
2005																		
2006																		
2007			0.36	0.15		0.29					0.38			0.17	0.28		0.37	
2008																		0.17
2009																		
2010								0.30	0.45									
2011		0.29								0.27			0.25		0.18		0.35	0.19
2012	0.20			0.13			0.37				0.31			0.25				
2013																		
2014						0.21												

	Pakistan	Peru	Philippines	Rwanda	Senegal	Sierra Leone	Tanzania	Togo	Turkey	Uganda	Zambia	Zimbabwe
1990	0.36											
1991		0.16										
1992				0.32								

(continued on next page)

Table 4 (continued)

	Pakistan	Peru	Philippines	Rwanda	Senegal	Sierra Leone	Tanzania	Togo	Turkey	Uganda	Zambia	Zimbabwe
1993									0.26			
1994										0.32	0.23	0.22
1995												
1996		0.18										
1998			0.28					0.17				
1999							0.19		0.30	0.27	0.28	0.16
2000		0.21		0.24								
2001												
2003			0.29									
2005				0.28	0.27							0.16
2006	0.29									0.22	0.30	
2007												
2008						0.23	0.17					
2010				0.23	0.23					0.26		0.19
2011												
2013						0.19		0.28			0.18	

Notes: D = Democratic; R = Republic. Gabon (2012) is statistically significant at the 0.005 significance level ($p = 0.001$). All other coefficients are statistically significant at the 0.001 significance level ($p = 0.000$).

Note: All coefficients are statistically significant at the 0.001 significance level ($p = 0.000$).

Note: All coefficients are statistically significant at the 0.001 significance level ($p = 0.000$).

GDP because it underlies measures of health and progress of the economy. In model 1, we start with solely GDP, which shows a statistically significant relationship with the intergenerational correlation coefficient. In model 2, we include the prevalence of HIV, life expectancy at birth, and the ratio of the female to male labor force participation rate and find that there is no change on the significance level of GDP, while the added variables show no statistical significance.

In model 3, we add government expenditure on education, pupil-teacher ratio, primary school starting age, primary school duration, secondary school duration, and compulsory education. The magnitude and statistically significance level of GDP decreases in this model. However, GDP increases in significance level in model 4 with the same results for the other variables after including fixed telephone subscriptions, mobile cellular subscription, extent of corruption, extent of political stability, and extent of voice and accountability. We thus observe that GDP has been more precisely estimated ($p < 0.01$). In this model, compulsory years of education and the extent of voice and accountability are statistically significant with $p < 0.01$, as the GDP, female to male labor force participation, pupil-teacher ratio, and primary school duration. Therefore, by using all variables in model 4, GDP, female to male labor force participation, pupil-teacher ratio, primary school duration, compulsory years of education, and the extent of voice and accountability have a statistically significant correlation with the intergenerational correlation of education. 39% of the variance in the intergenerational correlation of education can be explained by it.

Looking at the effect sizes, we can conclude that pupil-teacher ratio and primary school duration have the highest association with the intergenerational education correlation. A standard deviation increase in the pupil-teacher ratio leads to a 0.034 years increase in the intergenerational correlation of education. On the other hand, an increase in the primary school duration by one standard deviation leads to a decrease in the intergenerational correlation of education by 0.033 years. The female to male labor force participation rate and the extent of voice and accountability have smaller effect sizes. The intergenerational education correlation decreases by 0.026 years with one standard deviation increase in the female to male labor force participation, and increases by 0.028 years with a standard deviation increase in the extent of voice and accountability. GDP and the compulsory years of education have the least effect on the intergenerational education correlation. They decrease the education correlation coefficient by 0.012 years and 0.017 years respectively, following a standard deviation increase. The stepwise inclusion of contextual variables does not impact their effect sizes, which suggests that there is no collinearity between the variables.

6. Discussion and conclusion

We estimated the relationship between contextual characteristics and intergenerational correlation of education in the developing countries. The results show that the relationship between parent's education and the child's education is weaker in countries with a higher level of modernization. This corroborates the industrialization effect hypothesis (hypothesis 1). The negative effect of GDP on intergenerational education correlation may be due to the benefits of national output trickle down as expected. Our findings further suggest that a higher pupil-teacher ratio (more students per teacher) favors intergenerational education correlation, while higher primary school duration years and compulsory years of education reduce the intergenerational education correlation. This is in accordance with our hypothesis on education quality: the relationship between parents' educational attainment on their children's educational attainment is weaker in countries with greater access to education. It confirms hypothesis 2. More students per teacher may mean that teacher-student interaction, feedback and follow-up reduces, which in turn may relatively increase family involvement in student learning and progression. But increasing years of primary school and compulsory education extends student's

Table 5

The relationship between contextual characteristics and intergenerational correlation of education, stepwise.

Intergenerational correlation of education	(1)	(2)	(3)	(4)
Gross domestic product (GDP)	−0.012** (0.004)	−0.013** (0.004)	−0.009* (0.004)	−0.012** (0.004)
Prevalence of HIV		−0.010 (0.008)	0.012 (0.010)	0.011 (0.009)
+ Life expectancy at birth		−0.004 (0.009)	−0.002 (0.010)	−0.012 (0.010)
Female-male labor force participation		−0.010 (0.008)	−0.025** (0.007)	−0.026** (0.007)
Government expenditure on education			−0.010 (0.007)	0.009 (0.006)
Pupil-teacher ratio			0.030** (0.007)	0.034** (0.007)
Primary school starting age			0.004 (0.005)	0.004 (0.006)
+ Primary school duration			−0.035** (0.008)	−0.033** (0.009)
Secondary school duration			−0.005 (0.008)	0.003 (0.007)
Compulsory years of education			−0.012 (0.006)	−0.017** (0.006)
Fixed telephone subscriptions				0.013 (0.009)
Mobile cellular subscriptions				0.007 (0.009)
+ Extent of corruption				0.006 (0.007)
Extent of political stability				−0.013 (0.007)
Extend of voice and accountability				0.028** (0.007)
N	149	149	149	149
Adjusted R ²	0.0706	0.0889	0.3123	0.3917

* $p < 0.05$.

** $p < 0.01$; Standard errors are presented in parentheses.

interaction with the school and reduces family influence caused by the amount of time spent with the family.

Third, the female to male labor force participation rate is highly negatively related to education correlation across generations. This is in accordance with our hypothesis 3, which states that in countries with a high ratio of female to male labor force participation rate, the relationship between the educational level of the parents and the educational level of the children will be weaker. Female to male labor force participation in this context can be thought of as the extent at which countries have succeeded in combatting gender inequality, which helps in motivating aspiring youngsters as well as increasing competition. Lastly, voice and accountability for citizens has a positive relationship with education correlation. This effect contradicts hypothesis 5, which states that a higher positive state characteristic weakens the association of education across generation. This could be the case if voice and accountability for citizens is more to the advantage of parents so much that they tend to influence the decision on education of their children, from their perception of the state of this variable.

In comparison with the result for European countries carried out by Van Doorn et al (2011), GDP, female labor force participation, and pupil-teacher ratio are similar in the statistically significant level, with

the GDP having the highest effect size in Europe. However, the effect of the pupil-teacher ratio in Europe was not in accordance with the expected direction of influence. Generally, the effect sizes in the European context were all higher than those in developing countries in our study. This is perhaps partly due to the differences in state efficiency and effectiveness in utilizing inputs and outputs. Another contribution to this observation is that in developing countries, a high percentage of the population find themselves disadvantaged.

This result confirms our assumption that if contextual characteristics are part of the driving force in shaping the size of the intergenerational correlation of education, this should be portrayed in the decrease or increase of the relationship between the education of parents and the education of their children. The findings of this paper are in accordance with previous literature on the impact of contextual characteristics on the inheritance of parental educational attainment by their children. In the developing country context, our study establishes that cross-national differences in the intergenerational correlation of education in developing countries are moderated by the differences in the contextual characteristics of countries. These characteristics are reflected here by the level of industrialization, quality of education system, structure of the labor force and the nature of the institutions.

Our study has one most obvious policy implication. The quality of the education system is the most important explanation of the variation of the relationship between the educational attainment of parents and the educational attainment of their children across the developing countries. This suggests that governmental investment in the quality of education will reduce dependency of children's education on parents' education and therefore will increase socio-economic equality.

We acknowledge some limitations of this paper. First, there are other characteristics of the family and the community that might contribute to the extent of the educational attainment relationship between parents and children across countries, thereby reducing the intergenerational association between parents' education and children's education. Examples include parents' occupation, parents' age, family income, number of children living in the household, marital status, and community fixed effect. Another limitation is that although we use nationally representative data, the original sample sizes in this study are slightly modified by elimination of observations due to incomplete required information for the analysis as well as truncation by age groups. The estimates of the intergenerational correlation may have limited predictive power to a representative population given the less representative samples and the non-randomness of missing values. Therefore, representativeness of the results needs to be interpreted with cautiousness. We also observe that though the ordinary least square method is useful as it allows controlling for unobserved heterogeneity in the estimated relationship, we do not assume causality because of possible unobserved heterogeneity that can underlie the effects. Future research in this area would further contribute to explaining the role of contextual factors in the correlation of education across generations and mechanisms of these effects.

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Appendix A

Table A1–A4

Table A1
Survey Statistics.

Country	Survey year	Sample size	Years of Education				Country	Survey year	Sample size	Years of Education			
			Parents		Children					Parents		Children	
			Min	Max	Min	Max				Min	Max	Min	Max
Armenia	2000	1,987	0	19	0	19	Cameroon	1991	651	0	18	0	20
	2005	2,064	0	21	0	20		1998	951	0	18	0	18
	2010	2,082	4	23	0	20		2004	1,806	0	17	0	17
Bangladesh	1993	2,437	0	16	0	17	Chad	2011	2,899	0	17	0	17
	1996	2,344	0	16	0	16		1996	975	0	17	0	17
	1999	2,909	0	17	0	18		2004	917	0	17	0	17
	2004	2,888	0	17	0	17							
	2011	4,553	0	17	0	18							
	2014	4,449	0	18	0	18							
Benin	1996	804	0	17	0	19	Colombia	1990	2,369	0	20	0	20
	2006	2,707	0	20	0	19		1995	2,942	0	21	0	21
	2011	2,775	0	21	0	20		2000	3,209	0	20	0	20
Bolivia	1994	1,867	0	19	0	19	Congo Democratic Republic	2005	9,840	0	23	0	23
	1998	2,393	0	20	0	19		2007	2,054	0	18	0	18
	2003	3,960	0	17	0	17		2013	3,292	0	18	0	18
	2008	3,880	0	17	0	17							
Burkina Faso	1993	915	0	16	0	16	Congo Republic	2005	1,505	0	17	0	17
	1998	742	0	18	0	18		2011	1,306	0	17	0	17
	2003	1,886	0	18	0	18							
	2010	2,122	0	18	0	18							
Cambodia	2000	3,119	0	16	0	16	Cote d'Ivoire	1994	1,188	0	19	0	20
	2005	4,240	0	16	0	16		1998	486	0	18	0	17
	2010	6,012	0	20	0	20		2005	896	0	17	0	17
	2014	5,564	0	20	0	20		2011	1,826	0	18	0	18

Table A2
Survey Statistics (continued).

Survey Statistics (Continued):													
Country	Survey year	Sample size	Years of Education				Country	Survey year	Sample size	Years of Education			
			Parents		Children					Parents		Children	
			Min	Max	Min	Max				Min	Max	Min	Max
Dominican Republic	1996	1,985	0	18	0	19	Haiti	1994	1,049	0	17	0	17
	1999	337	0	17	0	18		2005	2,213	0	17	0	17
	2002	5,508	0	22	0	21		2012	3,060	0	17	0	17
	2013	2,288	0	23	0	20							
Egypt	1995	6,281	0	24	0	24	Honduras	2005	4,843	0	24	0	24
	2000	7,436	0	22	0	21		2011	5,798	0	23	0	20
	2008	7,864	0	22	0	20							
	2014	9,082	0	21	0	20							
Ethiopia	2000	2,878	0	18	0	18	Indonesia	1997	8,223	0	18	0	18
	2005	3,087	0	18	0	18		2002	9,015	0	17	0	18
	2011	3,087	0	18	0	18		2007	10,340	0	17	0	18
Gabon	2000	1,247	0	21	0	17	Jordan	1997	4,076	0	21	0	20
	2012	1,379	0	16	0	16		2007	7,709	0	20	0	18
								2012	7,495	0	19	0	18
Ghana	1993	623	0	20	0	17	Kazakhstan	1995	953	0	17	0	17
	1998	798	0	20	0	20		1999	1,124	0	17	0	16
	2008	1,905	0	20	0	19							
	2014	1,671	0	20	0	18							
Guinea	1999	1,018	0	20	0	19	Kenya	1993	1,533	0	20	0	19
	2005	1,143	0	20	0	18		1998	1,495	0	19	0	19
	2012	1,697	0	19	0	19		2008	1,468	0	23	0	21
								2014	5,810	0	22	0	20

Table A3
Survey Statistics (continued).

Country	Survey year	Sample size	Years of Education				Country	Survey year	Sample size	Years of Education						
			Parents		Children					Parents		Children				
			Min	Max	Min	Max				Min	Max	Min	Max			
Kyrgyz Republic	1997	940	0	16	0	16	Mozambique	1997	1,205	0	14	0	17			
	2012	2,331	0	24	0	21		2003	2,345	0	17	0	17			
Lesotho	2004	2,892	0	21	0	20	Namibia	2011	1,756	0	19	0	19			
		3,180	0	18	0	18		1992	991	0	18	0	19			
								2000	1,107	0	18	0	18			
Madagascar	1997	1,334	0	17	0	19		2006	1,543	0	19	0	18			
		2003	1,610	0	17	0		17	2013	1,446	0	20	0	16		
		2008	2,864	0	17	0	17	1996	1,990	0	14	0	14			
							2001	1,999	0	14	0	14				
Malawi	1992	646	0	19	0	14	Nepal	2006	1,840	0	14	0	14			
		2000	1,710	0	16	0		16	2011	2,216	0	11	0	11		
		2004	1,355	0	21	0		16	Nicaragua	1998	3,473	0	17	0	17	
		2010	2,846	0	18	0	17	2001		3,730	0	19	0	19		
		Mali	1995	1,226	0	16	0	16	Niger	1998	1,088	0	15	0	18	
2001	1,451			0	19	0	19	2006			1,464	0	21	0	19	
2006	2,190			0	17	0	17	2012			1,399	0	21	0	20	
2012	1,662			0	23	0	20	Nigeria			1990	1,739	0	19	0	17
Morocco	1992			2,891	0	19	0				19	2003	1,681	0	20	0
	2003	5,742	0	20	0	22	2008		5,484	0	21	0	18			
							2013		6,475	0	20	0	20			

Table A4
Survey Statistics (continued).

Country	Survey year	Sample size	Years of Education				Country	Survey year	Sample size	Years of Education			
			Parents		Children					Parents		Children	
			Min	Max	Min	Max				Min	Max	Min	Max
Pakistan	1990	2,916	0	20	0	20	Tanzania	1999	649	0	15	0	15
	2006	7,115	0	16	0	16		2010	1,776	0	20	0	16
Peru	1991	4,515	0	16	0	16	Togo	1998	1,497	0	24	0	23
	1996	7,781	0	16	0	16		2013	1,675	0	17	0	17
	2000	7,864	0	17	0	17							
Philippines	1998	3,649	0	16	0	16	Turkey	1993	2,648	0	17	0	17
	2003	3,545	0	17	0	17		2003	3,508	0	19	0	19
Rwanda	1992	1,399	0	15	0	17	Uganda	1995	765	0	18	0	18
	2000	1,459	0	18	0	17		2000	891	0	20	0	19
	2005	2,129	0	18	0	19		2006	1,183	0	18	0	18
2010	2,779	0	18	0	18	2011		1,175	0	18	0	18	
Senegal	2005	2,737	0	20	0	20	Zambia	1996	1,465	0	20	0	17
	2010	3,130	0	21	0	21		2001	1,256	0	17	0	17
								2007	972	0	18	0	18
						2013		2,520	0	19	0	17	
Sierra Leone	2008	1,239	0	18	0	18	Zimbabwe	1994	989	0	17	0	19
	2013	2,410	0	19	0	19		1999	951	0	18	0	17
								2005	1,531	0	19	0	16
								2010	1,352	0	21	0	20

Appendix B

Table B1

Table B1
Intergenerational Transmission of Education.

	(1)			(2)		
	Coefficient	Standard error	P-value	Coefficient	Standard error	P-value
Child education						
Parent's education	0.5262	0.0016	0.000	0.390	0.0018	0.000
Children age ≤ 5	No			− 0.509	0.008	0.000

(continued on next page)

Table B1 (continued)

Child education	(1)			(2)		
	Coefficient	Standard error	P-value	Coefficient	Standard error	P-value
Parent's gender	No			(base)		
Father				0.152	0.0189	0.000
Mother						
Region of residence	No			(base)		
Urban				−1.369	0.020	0.000
Rural						
Wealth quintiles	No			(base)		
Poorest				0.708	0.027	0.000
Poorer				1.266	0.027	0.000
Middle				1.705	0.029	0.000
Richer				2.321	0.031	0.000
Richest				0.071	0.002	0.000
Child's age	No					
Child's gender	No			(base)		
Male				−0.010	0.015	0.507
Female				0.028	0.001	0.000
Year	No			−0.004	0.001	0.000
Country	No					
R ²	0.3095			0.3897		
N	406,253			406,253		

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