

# Pobreza, exclusión y desigualdad

Jorge Granda Aguilar

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# Intergenerational transmission of education: gender and ethnicity in Guatemala

Priscila Hermida\*

There is reason to believe that the high degree of inequality as well as stratification prevalent in developing countries may contribute to greater persistence in the intergenerational transmission of opportunities. This paper describes the intergenerational transmission of educational attainment in Guatemala through the degree of regression to the mean of the schooling of children compared to the schooling of their parents, interpreted as a measure of equality of opportunity in Guatemalan society. The approach extends the study of the process of intergenerational transmission of educational attainment in the developing world, to include ethnicity and gender as factors associated with this process. The results show that educational achievement exhibits higher persistence from generation to generation among indigenous people, and for women. There are systematic differences in the degree of persistence in educational attainment according to ethnicity with indigenous people being less mobile than whites. People do not tend to regress to the mean of the population in terms of their educational attainment—a sign of relative equality of opportunity—, but that an individual's education and chances in life are strongly correlated with those of his parents.

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## Introduction

There is vast evidence that income and education are transmitted from generation to generation<sup>1</sup>. These intergenerational correlations have implications for the degree of equality of opportunity in a particular society and make its members more or less mobile. Schooling in particular is a mechanism of intergenerational mobility because it increases the probability of an individual's children to be educated, and thus increases their future expected income. If schooling is strongly affected by family background, then intergenerational correlation in incomes across families will be high and social mobility will be low. Intergenerational transmission of schooling affects individuals' opportunities and their well-being over time.

Not much is known about the process of intergenerational transmission of educational attainment in the developing world, mainly due to the lack of longitudinal datasets. There is however reason to believe that the high degree of inequality as well as stratification prevalent in developing countries may contribute to greater persistence in the intergenerational transmission of opportunities. This paper will focus on the intergenerational transmission of educational attainment in Guatemala and explore the effect of high inequality in the distribution of assets between the white and indigenous ethnic groups on social mobility. The degree of regression to the mean of the schooling of children compared to the schooling of their parents will be interpreted as a measure of equality of opportunity in Guatemalan society.

## Motivation and Hypotheses

The determinants of the parental decision on the optimal level of education of children were examined by Becker (1975). Assuming altruism and perfect capital markets, parents maximize the family wealth by investing

<sup>1</sup> For studies concerning the intergenerational transmission of income, see Solon (1992) and Zimmerman (1992). For studies exploring the transmission of educational outcomes, see Behrman et al (2001), Borjas (1992) and Mulligan (1999).

in the human capital of each child to the point at which the marginal rate of return is equal to the marginal cost. Given perfect credit and information markets, the optimal level of investment in education is reached regardless of family background characteristics, including wealth or ethnicity. However, in less developed countries wealth tends to be highly correlated with ethnicity and markets do not function efficiently. Liquidity constraints become very important in this setting, since great proportions of the populations tend to be poor - lacking any form of collateral- and credit markets very underdeveloped. If one ethnic group is systematically poorer than others, different groups will exhibit different levels of investment in education, either given by differences in credit constraints (cost of education) or rates of return (due to perceived or actual discrimination in the labour market)<sup>2</sup>. But not only can the average level of schooling be influenced by inequality in the distribution of assets: disadvantaged groups for which returns to education are lower and that face liquidity constraints due to poverty, may show greater *persistence* in educational attainment.

Intergenerational transmission of schooling is the result of both genetics –for instance, the transmission of intelligence or ability–, and environmental factors –like learning skills, nutritional status, and preferences for education–. How would these mechanisms work for different ethnic groups if horizontal inequalities are widespread and social exclusion related to ethnicity is present? Although it would be impossible to claim that ability and intelligence are distributed in a non random fashion conditional on ethnicity or gender, the fact that indigenous people in Guatemala are by large at the bottom of both the education and income distribution in a very unequal society, can lead us to expect differences in mobility for whites and non whites due to direct and indirect effects of Parental Education, assortative matching of parents on education, and social exclusion.

<sup>2</sup> As noted, “..differences in opportunities, such as those resulting from discrimination and nepotism, affect demand curves.” Becker (1975: 110)

## Guatemala

According to the World Bank, the total population of Guatemala in 2000 was around 11,4 million, out of which 39,2% were indigenous and 60.8% white (World Bank, 2003). Approximately 56,2% of Guatemalans live in poverty; while 15,7% live in extreme poverty. Income inequality in the country is among the highest in the world, with a Gini coefficient is of 0,57.

The proportion of indigenous population is one of the biggest in Latin America. The largest group is the Mayan –comprising the Kiche, Qeqchi, Kaqchiquel, Mam and others–; there are also two small non-Mayan groups, the Xinca and the Garífuna. Most of the Mayan people –about one million– are of Kiche origin and live in the western highlands near the cities of Santa Cruz and Chichicastenango. There are between one million and two million Mams and Kaqchiquels, with this last group located in the northwest part of the country near the Mexican border. The Qeqchi can be found in the north eastern region of Alta Verapaz, and are estimated to be around 400 000 (Dictaan-Bang-oa and Medrana, 2002). Other groups include the Chorti, Achi, Ixil, Poqomam, and Tzutuil.

Guatemalan society has been historically characterized by stratification based on ethnicity. Since independence from Spain in the early 19<sup>th</sup> century, wealth has been concentrated in a small white elite. Elites used cheap indigenous labour for export-oriented crop industries –coffee, sugar, cotton, cardamom and rubber– during the 19<sup>th</sup> and 20<sup>th</sup> centuries. Forced labour in plantations and coercive recruiting systems were common. A functioning labour market did not develop until the mid 20<sup>th</sup> century. Today indigenous people mainly engage in small farm production and obtain seasonal labour earnings from migration. Guatemala has long been affected by political violence. Civil war started in 1960 and did not end until democracy was reinstated in 1986. In 1996 Peace Agreements were signed between the Guatemalan Government and the Guatemalan National Revolutionary Unity (URNG). Throughout the 1980's, rural areas and indigenous communities were particularly affected by violence, with long term economic and demographic effects. As a

result of the civil war, fewer families engage now in agricultural activities. Rural economies based on grain production have given way to small-scale commercial agriculture and activities in services, transport and other non-agricultural activities. During the 1990's the indigenous population migrated to the lowland plantations, the capital or regional market cities in order to increase their income, and has become older and more urban as a result.

Overall, indigenous people still face barriers in the education, labour and credit markets and have less opportunities for acquiring different forms of capital; mainly as a result of discrimination and other types of market failure (Vakis, 2003). Income inequality in Guatemala has been found to be correlated to differences in assets such as education, land, housing and geography; and also to ethnicity (World Bank, 2003).

## The Education System

School age population in Guatemala covers children between 5 to 18 years old. According to ENCOVI<sup>3</sup> data, there are 4.65 million Guatemalans of schooling age. The education system consists of three levels: Pre-primary (5 and 6 years of age), Primary (7 to 12 years) and Secondary (13 to 18 years of age). Secondary is divided in two components: basic (13 to 15 years) and diversified (16 to 18 years). The duration of compulsory education is 7 years, after which students may leave the education system at the end of Primary schooling, usually at age 12-13. Higher education is provided by one public, and several private universities. The language of instruction is Spanish, and there is limited bilingual education in rural areas.

The effectiveness of the educational system is constrained by a shortage of trained teachers, inadequate school buildings, and long distances from home to school for many students. Enforcement of Primary school attendance is very lax. Net primary enrolment is 85%, but a gender gap

3 Encuesta Nacional de Condiciones de Vida (ENCOVI), a national household survey carried out for the first time in 2000.

remains (UNDP, 2002). An important characteristic of the Guatemalan education system is the problem of over-age and late enrollment (Edwards, 2002). While the system fails to meet the target for Pre-school, Secondary and Higher Education, the Primary school level is overburdened by over-age and repetition. Significantly, 100% coverage is not reached in any schooling level or age, which means that many children never go to school.

The distribution of education is very unequal and is correlated with the income distribution (Edwards, 2002). According to the UNDP, 70% of the population reads and writes, although there are important differences between urban and rural areas, and between ethnic groups (UNDP, 2000). Educational attainment is considerably lower in rural communities because children tend to be employed in farming and educational facilities are not always available. Differences in schooling between sons and daughters have been found to be important in rural households, both indigenous and non indigenous (UNDP, 2000). Children who abandon school stop acquiring a very important form of human capital, and the probability of them becoming poor in adulthood increases. They may become poor fathers and mothers of poor children, their educational attainment influencing the attainment and income of their offspring.

## Data set and Analysis

### Dataset

The ENCOVI dataset was used in this paper for the analysis of educational mobility. It is the first Living Standards Measurement Survey available for Guatemala, conducted between July and November of 2000 by the Instituto Nacional de Estadística (INE), with support from the World Bank and the Inter American Development Bank. It is a nationally representative survey, covering urban and rural areas<sup>4</sup>. Information from each

<sup>4</sup> The two-staged, stratified sample comprised 8 940 households without replacement. Estimated rejection rate was 10%.

household was collected on income, expenditure, prices, education, health, labour market participation and access to public services.

The data from ENCOVI used was education (years) of each surveyed individual and the educational attainment of her parents. The parental education variable is a categorical one and was transformed into a continuous variable for the effects of the analysis<sup>5</sup>. Individuals younger than 22 years old were eliminated from the sample since there is a possibility that they are still enrolled in the education system. The final sample contains 15 662 cases for which complete information on individual and parental education is available. In order to explore the change in educational mobility over time, respondents were divided into four cohorts corresponding to individuals born from 1900 to 1978. A variable describing being born in a rural area or in a city was created from information on the survey. A variable describing the difference in educational attainment between the father and the mother of the individual was also created as a proxy for the degree of assortative mating.

### Descriptive Statistics:

Out of the resulting sample, 47 % individuals are male and 53 % female. In terms of ethnicity, 61.4 % are white and 38,6 % describe themselves as indigenous. The sample is evenly divided into individuals born in rural (52,4%) and in urban areas (47,6%). The average schooling for the whole sample is 4,7 years. A third of the sample (27%) has zero years of education, and an additional 39% has not completed primary school. These figures are consistent with other sources of data for education in Guatemala. An important group of individuals (14%) only reads and writes. The percentages of people who have completed primary or secondary school are around 13% each. Only around 6% of the sample has higher education.

As shown in Figure 2 in the Appendix, the distribution of educational attainment in Guatemala is skewed to the right with mean of 4,7 years

<sup>5</sup> The categories for parental education in the survey are: “No Education” (0 years), “Incomplete Primary” (1-5 years), “Primary” (6 years), “Incomplete Secondary” (7-11 years), “Secondary” (12 years) and “Higher Education” (more than 12 years).

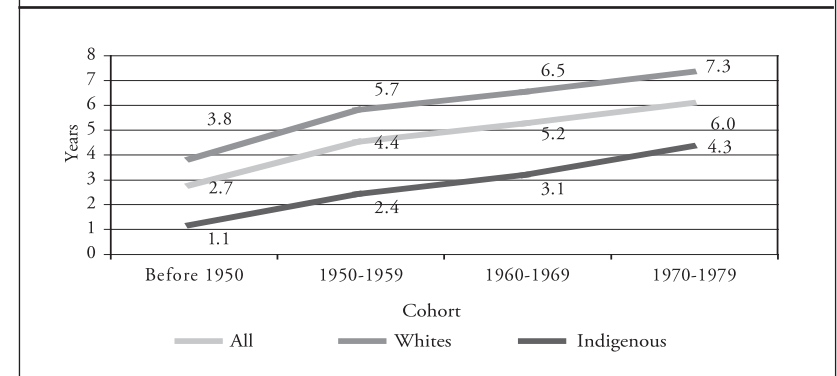


and median of 4 years of schooling. On average, men have more education than women, and white people are more educated than the indigenous. Similarly, the dispersion in the distribution is bigger for whites than for indigenous. The descriptive statistics for the sample as a whole conceal important sub-group differences (Table 1). On average, a white man will have more than four years of education than an indigenous woman. In the same way, the median of the distribution of schooling for white men is 6 years—meaning that 50% of the members of the group will have more than a primary school education—, whereas the median for indigenous women is zero years. At least 50% of this subgroup will have no education at all.

A corresponding pattern of inequality in the distribution of human capital can be found when analyzing the education of the parents of individuals on the sample. The lack of provision of schooling in Guatemala—particularly for women and for those in rural areas—during the first half of the twentieth-century explains the low levels of parental education. Overall, fathers are more educated than mothers, and both have very few years of education. Mothers in particular are deprived of schooling. The means of the distributions of father's and mother's schooling are 2,3 and 1,6 years respectively. The median of years of education is zero for both; therefore at least half of all mothers and fathers had no schooling. Whites have more educated parents than indigenous people, with the difference being around an additional 2 years of schooling on average for fathers and mothers educational attainment.

Over time, educational attainment improves for all, but as mentioned, the process starts at very low levels of human capital stock. For the sample as a whole, educational attainment has constantly increased, with the greatest gains made by those born before 1960. The average number of years of education has gone from 2.7 years for those born before 1950, to 6 for the cohort born between 1970-79, as can be observed in Figure 3. In spite of that, uneven progress is shown when comparing gains made in education by indigenous people vs. whites.

Figure 3.  
Progress in educational attainment, by Cohort



Although average schooling has increased for both ethnic groups during the past century, it has only done so by around 3 years, with the overall mean going from 3 years for the first cohort, to 6 years for the 1970-79 birth cohort. The rate of growth in average schooling has similar for non-whites than for whites, but indigenous people start at a mean of 1 year of education for the first cohort, vs almost 4 years for whites<sup>6</sup>. There seems to be no convergence in average schooling between white and indigenous Guatemalans. Public efforts to make the distribution of education less unequal seem to have failed: the gap in average years of education between whites and non-whites has remained constant at 3 years for more than six decades, as can be observed in Figure 3.

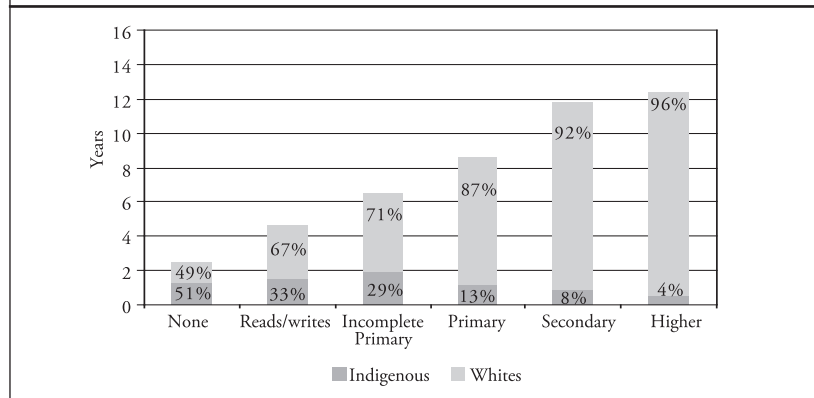
### The Education of Parents and Children

Educational attainment has improved in the last century and as a result, Guatemalans born in later cohorts have more education than their fathers and their mothers. However, consistent with lack of social mobility, big differences in educational attainment conditional on parental education

<sup>6</sup> According to the data, it took 50 years (from 1900 to 1950) to increase average schooling of indigenous people from 0.5 to 1 whole year.

remain. Across the whole sample, the data confirm that more educated parents will have more educated sons and daughters. For example, as shown in Figure 4, the difference in the average years of schooling between the off-spring of a man with no education, compared to the child of a parent who has gone to University, is of more than 10 years. People do not tend to regress to the mean of the population in terms of their educational attainment –a sign of relative equality of opportunity–, but it rather seems that an individual's education and chances in life are strongly correlated with those of his parents.

Figure 4.  
Average years of education, by Father's Schooling

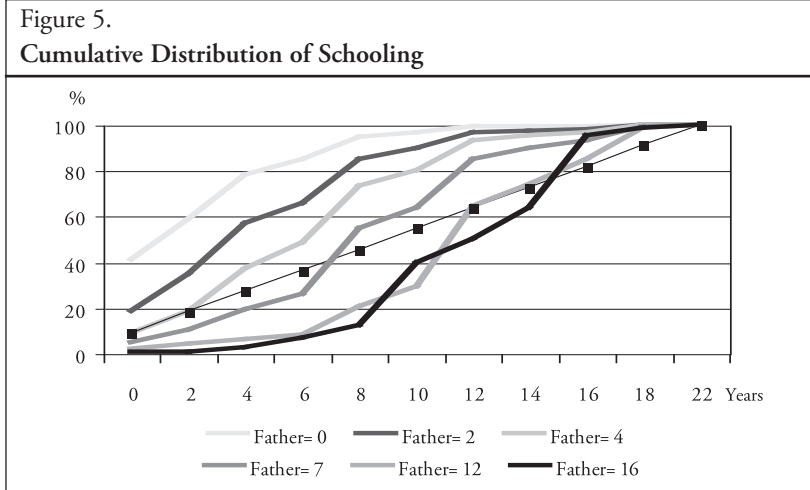


There is an additional ethnicity dimension in the process of transmission educational attainment: indigenous people start the process of acquiring human capital from a disadvantage position since on average, indigenous mothers and fathers are less educated than their white counterparts. Moreover, the data show that as the average number of years of schooling increases, the proportion of indigenous people decreases. For example, while 51% of those with an average of 2 years of schooling are indigenous and 49% white, the percentages are 4% and 96% respectively for those with an average of 14 years of schooling. This seems to confirm the hypothesis that non-whites drop from school sooner, and that indigenous

people are faced with a different set of incentives and disincentives to invest in the education of their offspring.

Figure 5 shows the cumulative distribution of education for the whole sample, conditional on parental years of schooling. If the probability of a person attaining a particular level of schooling is not affected by the parent's level of education, then perfect mobility exists. The black 45 degree line represents a situation where, for a given level of parental schooling, children's years of education are distributed evenly across all possible educational outcomes, thus representing perfect mobility. The distance (upwards or downwards) from the cumulative distribution to the 45 degree line can be thought of as a measure of persistence. However, given that the genetic inherited component of ability is correlated with educational attainment, perfect mobility should not be expected even in the presence of a good degree of educational mobility.

The graph shows that persistence is higher for children of parents with little or no schooling and less important for children of parents that have completed primary schooling. The implications of persistence at the bottom of the education distribution are highlighted by the fact that the median of parental education is zero years. The probability for a child of uneducated parents to continue in the same educational category is 40%. Having parents that only read and write halves the probability of children having no education down to 18%, while the probability of having zero years of education for children of parents who have primary schooling is of only 4%. Great intergenerational gains in human capital can be made with modest increases in parental schooling.



More mobility can be observed at the middle of the distribution: the cumulative distribution for children of parents that have complete primary is the closest to the 45 degree line, with the top 50% having more than 8 years of schooling. Persistence becomes important again at the top end of the distribution: 50% of children born to a parent with higher education will go beyond secondary schooling, compared with only 10% of children born to parents with primary schooling.

## Regression Results

### Empirical Framework:

Ordinary Least Squares regression can be used to measure the effect of family background on the educational attainment of the next generation. Table 2 summarizes results obtained using this methodology for developed and less developed countries:

Study	Persistence	Country
Borjas (1992)	0.25	United States
Mulligan (1997)	0.32	United States
Couch and Dunn (1997)	0.20	Alemania
Beehrman et al (2001)	0.35	United States
Beehrman et al (2001)	0.70	Brazil
Beehrman et al (2001)	0.70	Colombia
Beehrman et al (2001)	0.50	Mexico
Beehrman et al (2001)	0.50	Peru
Veloso and Guimares (2003)	0.68	Brazil

We will model mobility through a Markov model in which the value of the variable of interest –in this case educational attainment– for individual  $i$  in period  $t$  ( $S_{it}$ ) depends on the value of the variable in the previous period ( $S_{it-1}$ ) and a stochastic term ( $u_{it}$ ). The observation for the previous period carries all relevant information about individual  $i$ , including transitory shocks.

$$S_{it} = bS_{it-1} + u_{it}$$

The parameter  $b$  in this model is positive and greater than one if real growth in  $S$  takes place. If  $b$  is defined as distance from its mean, then  $b$  becomes a measure of persistence and  $b < 1$  implies regression towards the mean. The coefficient  $b$  obtained through OLS regression measures the intergenerational persistence of educational attainment. The expression  $1-b$  is called the degree of regression to the mean, or degree of intergenerational mobility in education. A value of  $b$  close to one suggests a very limited degree of intergenerational mobility, whereas a low a value of  $b$  is a sign that educational attainment is not strongly correlated across generations. Several unobserved factors are incorporated into the value of  $b$ , such as individual ability, cultural background, family wealth, spatial segregation related to education quality, and public provision of education<sup>7</sup>.

<sup>7</sup> Checchi (2006).

For this reason, no causal relationship between parental and child education should be inferred, and  $b$  will be interpreted as a measure inequality of opportunity, a mechanism of transmission of the effect of family characteristics –particularly ethnicity– on socio-economic outcomes.

### OLS Results for the Whole Sample

This section reports the estimates of intergenerational mobility obtained for the Guatemala ENCOVI sample. All models included the educational attainment of the respondents of the survey as the dependent variable, and parental years of schooling as the main explanatory variable. A first set of results was obtained for the whole sample, through a basic model using respondent's and father's education and incorporating controls for cohort, gender, ethnicity and area of birth. The mother's level of education was also included as a regressor in order to establish whether father's and mother's education had any differential effect on the educational attainment of the child. Table 3 shows baseline estimations of intergenerational transmission of schooling.

	Model 1		Model 2		Model 3	
Father's education	0,60 (0.0)	**			0,38 (0.0)	**
Mother's education			0,69 (0.0)	**	0,42 (0.0)	**
Dummy Indigenous	-1.37	**	-1.26	**	-1.07	**
Dummy Female	-1.23	**	-1.27	**	-1.24	**
Dummy Rural	-2,02	**	-2,07	**	-1,76	**
Born before 1950	-2,43	**	-2,61	**	-2,32	**
Born 1950-59	-1,09	**	-1,20	**	-1,01	**
Born 1960-69	-0,42	**	-0,52	**	-0,38	**
R-squared	0,485		0,481		0,523	
Mean= 4.66						
N= 15,662	*p<0.10,** p<0.05					

A high coefficient of persistence signals low mobility and inequality of opportunity between individuals in a society; and is more important when the mean of the distribution of schooling is low –as is the case in Guatemala– because it suggests that scarce human capital is concentrated by a few. For example, according to Model 1, the child of a father one year of schooling below the mean of the distribution will be 0,6 years below the mean too. The higher the value of, the more likely it is that the children of very educated parents acquire education, and that the children of poorly educated ones remain uneducated. The estimate of the coefficient of persistence for the education of the mother (2) was higher, at 0,69, initially suggesting a greater impact of maternal education on the persistence of educational attainment of the respondent. These estimates are consistent with those obtained by Behrman et al (2001) for other Latin American countries –0,7 Brazil and Colombia, 0,5 for Mexico and Peru–, as well as with the figure of 0,68 for Brazil obtained by Veloso and Guimães (2003). Still, a  $b$  of 0,6 is significantly higher than estimates –ranging from 0.25 to 0.35– obtained for developed countries and discussed earlier.

By using only the schooling of the most educated parent as an explanatory variable, previous studies fail to take into account the combined effect of the education of both father and mother. The omission of mother's education as an explanatory variable in the transmission of educational attainment can lead to misleading estimates. It is possible that in those cases, the  $b$  coefficient would pick up the effect of the education of the other parent and overestimate the degree of persistence, by ignoring the mechanism of transmission of inequality resulting from assortative matching. When both variables were included in the regression (3), similar coefficients of 0,38 and 0,42 were obtained for father's and mother's education, indicating that the effects of father's and mother's education reinforce each other and seem to be of the comparable magnitude. The coefficients are statistically different from each other, suggesting that mothers schooling is more important than father's in terms of persistence.

For the three model specifications, all explanatory variables –including controls for ethnicity, gender, region and cohort– are statistically significant and have the expected sign. The value of R-squared is around

0,48, quite high for a specification with few controls. People born in rural areas have less education when compared to those in cities. Younger cohorts have more schooling than older cohorts, and being born before the last cohort (1970-1979) has a negative effect on average years of education<sup>8</sup>. Women have on average 1,2 less years of education than men, and the value of the coefficient associated with the dummy for gender does not differ much between the three specifications. The effect of being indigenous on average schooling is negative and significantly different between models. In Model 1, non white respondents have on average 1,4 years of education less than whites. However, when both parental education variables are considered (Model 3), the penalty for being indigenous decreases by 29% to 1 less years of education. This could be explained by the characteristics of the education distribution over time: indigenous women have the lowest level of educational attainment in all birth cohorts, and therefore controlling for the education of the mother decreases the disadvantage particular to indigenous people. The education of mothers appears to be an important channel for the intergenerational transmission of inequality in the indigenous population.

### Analysis by Cohort

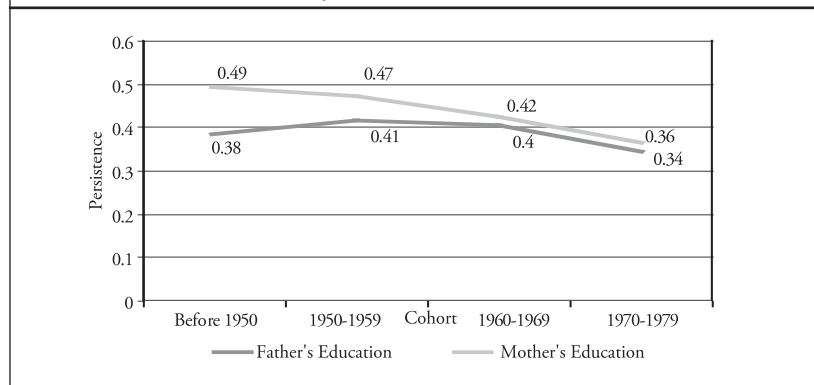
In order to explore whether the pattern of persistence in educational attainment had presented any changes over time, separate regressions were run by cohort of birth. The models included controls for ethnicity, area of birth, and gender, defined in the same way as for the previous section. The results are shown in Table 4 in the Appendix. The R-squared coefficients are between 0.46 and 0.5 for all regressions. All variables are significant and have the expected sign. We observe that the average difference in years of education between white and indigenous people remains almost unchanged for all cohorts. Although apparently reducing for the those born between 1970 and 1979, the dummy for being indige-

8 Cohort 1: born before 1950; Cohort 2 : 1950-1959, Cohort 3: 1960-1969; Cohort 4: 1970-1979.

nous shows a white person will have on average around 1 additional year of education than an indigenous person, holding all other factors constant. This figure has remained unchanged for the entire twentieth century, in spite of gains in mean level of schooling for both groups. The penalty in years of education for females actually increases over time, with men having on average 1,2 more years of education than women. Rural population is consistently less educated: people born in urban areas have on average almost two additional years of education when compared to people born in rural areas. Overall it seems that persistence is decreasing, but the average difference in the levels of educational attainment for subgroups of the sample remains.

Figure 6 shows the evolution of the persistence coefficient for both parents over time. Social mobility is improving in Guatemala, but at a very slow rate. Younger cohorts have lower levels of persistence for parental education. Although mother's education seems to have a bigger effect than father's education on the schooling of the next generation, the difference decreases over time, converging around 0,35. We observe that the degree of persistence of father's education for each cohort are very close in magnitude and not significantly different from one another. Although the mean of the distribution of schooling increases steadily over time, the overall degree of regression to the mean is not that different between cohorts. The child of a father with one year of education above the mean will have more or less an additional 0,4 years of schooling above the mean for Cohorts 1, 2, 3 and 4; a time span covering those born before 1950 to those born in 1979. The conditional distribution of educational opportunities seems to have remained approximately constant over time with respect to educational family background. This finding would contradict the idea of a substantial "opening up" of opportunities, –and a decrease in the correlation between father's and child's human capital–, in Guatemala in the XXth century, at least without taking into account differences between subgroups.

Figure 6.  
Coefficient of Persistence, By Cohort



While the father's coefficient remains without much change, the persistence coefficient on Mother's schooling has decreased consistently over time, perhaps as a result of advances in the education of women during the second half of the XXth century that increased average level of schooling, thus making all mothers in younger cohorts more educated. This educational expansion decreased the relative effect on persistence of having a more educated mother observed for older cohorts. The education of mothers, –operating on persistence through assortative mating and cultural influences–, may be a factor that determines the distribution of opportunities over time.

### Model with interactions

In order to explore specific channels that affect the degree of persistence in educational attainment, interaction terms for ethnicity, assortative matching and gender are added to a model, including the same set of controls as the one introduced in previous sections. The results for the interaction coefficients are shown in Table 5<sup>9</sup>.

<sup>9</sup> The coefficients of all control dummies were significant and of very similar magnitude in all specifications.

Table 5. Intergenerational Transmission of Parental Education

	(1)	(2)	(3)	(4)	(5)
Father's education	0.38 ** (0.0)	0.36 ** (0.0)	0.33 ** ** (0.0)	0.33 ** (0.0)	0.57 (0.0)
Mother's education	0.42 ** (0.0)	0.43 ** (0.0)	0.44 ** ** (0.0)	0.44 ** (0.0)	0.49 (0.0)
Ethnicity Interaction		0.10 ** (0.0)	0.10 ** (0.0)	0.10 ** (0.0)	0.02 ** (0.0)
Ass. Mating Interaction			0.01 ** (0.0)	0.01 ** (0.0)	0.01 ** (0.0)
Gender Interaction				-0.01 (0.0)	
Father's Educ Squared					-0.04 ** (0.0)
Father's Educ Cubed					0.0 ** (0.0)
Dummy Indigenous	-1.07 **	-1.20 **	-1.2 **	-1.2 **	-1.02 **
Dummy Female	-1.24 **	-1.23 **	-1.23 **	-1.22 **	-1.23 **
Dummy Rural	-1.76 **	-1.74 **	-1.74 **	-1.74 **	-1.69 **
Born before 1950	-2.32 **	-2.29 **	-2.29 **	-2.29 **	-2.22 **
Born 1950-59	-1.01 **	-1.00 **	-1.00 **	-1.00 **	-0.97 **
Born 1960-69	-0.38 **	-0.36 **	-0.36 **	-0.36 **	-0.35 **
R-squared	0.523	0.524	0.524	0.524	0.528
N= 15,662 *p<0.10, **p<0.05					

To test whether indigenous people have a different level of persistence than whites, we introduce an interaction term between ethnicity and father's schooling, in addition to the dummy variable for the difference in the intercept. This approach helps to control for the difference in average levels of schooling between the two groups. As opposed to running the regression for whites and indigenous separately, the coefficient will estimate the difference in persistence between a white person and an indigenous person, in relation to the mean of the distribution of education of

the entire sample, thus testing equality of opportunity in the society as a whole. Consistent with our previous finding that indigenous people have higher levels of persistence in educational attainment, we find the interaction term to be significant and positive. On average, being indigenous increases the degree of persistence from 0,36 to 0,46 years from the mean, a 28% increase in the value of the coefficient.

By including an interaction term for assortative matching, we can see how the persistence coefficient changes as the distance between spouses' education grows. The assortative matching variable is defined as the absolute value of the difference between the education of the father and the education of the mother, measured in years. At high levels of sorting on education, the value of the variable will be close to zero; with less sorting the value of the variable increases. We find that, on average, distance between partner's education has a positive effect on the degree of persistence. The value of the interaction coefficient is close to zero, but significant in all specifications. In addition, the specification in Model 4 shows no specific differential effect of gender on persistence. These findings seem to contradict our initial hypotheses that assortative matching decreases persistence and that mobility patterns may differ by gender. However, it is possible that the decrease in mobility associated with educational distance between the partners is related to higher educational homogamy found amongst urban and white couples (Quisumbing and Hallman, 2003); therefore catching some of the effect of ethnicity on persistence.

Finally, when non-linearity in the intergenerational correlation in schooling is taken into account by introducing a squared and cubed term for Father's education, we find both terms significant. The cubed terms shows higher levels of persistence at the bottom and at the top of the distribution of schooling. As a result of the change in functional form, the ethnicity interaction term falls in magnitude and stops being statistically significant, implying that the stickiness of education attainment is higher among indigenous people due to the fact that they are mostly found at the bottom of the education distribution ( as well as in the unobserved income distribution). There seems to be evidence of a poverty trap, with ethnicity being a proxy for exclusion and lack of opportunity associated with credit constraints.

## Conclusions

This paper extends the study of the process of intergenerational transmission of educational attainment in the developing world, to include ethnicity as a factor associated with this process. Using several specifications, the results show that educational achievement exhibits higher persistence from generation to generation among indigenous people. The effect of father's education on persistence seems to be more important for males. For females, the education of the mother may contribute positively to educational mobility. The finding is in line with other studies in developing countries that suggest that mother's with more schooling influence intra-household allocation of resources. Cohort analysis shows that social mobility is improving in Guatemala, but at a very slow rate. Younger cohorts have lower levels of persistence for parental education, but the overall degree of regression to the mean is not that different between cohorts. The conditional distribution of educational opportunities seems to have remained approximately constant over time with respect to educational family background. This finding would contradict the idea of a substantial "opening up" of opportunities, –and a decrease in the correlation between father's and child's human capital–, in Guatemala in the XXth century. Women seem to be more mobile than men, an effect perhaps arising from a "catching up" resulting from a trend of improvement of the average level of schooling. persistence at the bottom and at the top of the distribution of schooling. Persistence of educational attainment is higher among indigenous people due to the fact that they are mostly found at the bottom of the education distribution ( as well as in the unobserved income distribution). There seems to be evidence of a poverty trap, with ethnicity being a proxy for exclusion and lack of opportunity associated with credit constraints.

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## Appendix

Table 1. Descriptive Statistics for Education Variables					
	Whole	White		Indigenous	
	Sample	Men	Women	Men	Women
YEARS OF EDUCATION					
Mean	4.7	6.3	5.4	3.7	1.9
Median	4	6	4	3	0
SD	4.7	4.9	4.8	3.9	3.1
Interquartile range	7	7	7	6	3
EDUCATION OF THE FATHER					
Mean	2.3	3.1	3.1	1.1	1.0
Median	0	2	2	0	0
SD	3.6	4.0	4.1	2.2	2.1
Interquartile range	4	4	4	2	0
EDUCATION OF THE MOTHER					
Mean	1.6	2.4	2.4	0.5	0.4
Median	0	0	0	0	0
SD	3.1	3.5	3.5	1.4	1.5
Interquartile range	2	4	4	0	0
N	15,662	4,478	5,140	2,881	3,163

Table 4. Intergenerational Transmission of Parental Education, by Cohort of Birth				
	Born before 1950	1950-1959	1960-1969	1970-1970
Father's education	0.38 ** (0.02)	0.41 ** (0.0)	0.40 ** (0.02)	0.34 ** (0.02)
Mother's education	0.49 ** (0.02)	0.47 ** (0.0)	0.42 ** (0.02)	0.36 ** (0.02)
Dummy indigenous	-0.98 **	-1.19 **	-1.28 **	-0.89 **
Dummy female	-0.90 **	-1.62 **	-1.39 **	-1.19 **
Dummy rural	-1.29 **	-2.11 **	-1.98 **	-1.75 **
R-squared	0.506	0.509	0.489	0.464
N=	4,159	2,975	3,865	4,663
Mean	2.71	4.45	5.20	6.09
*p<0.10,**p<0.05				

Figure 1.  
Educational Attainment, By Educational Category

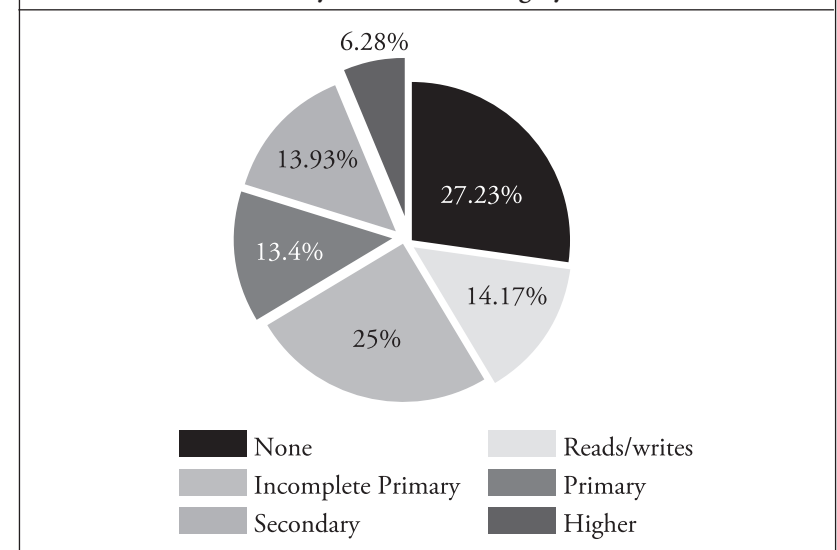


Figure 2.  
Education Distribution in Guatemala, by Ethnicity

