# Educational Expansion in Latin American Countries: Has Educational Attainment Inequality Narrowed?[1]

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**Abstract**

Over recent decades, countries in Latin America have made a great deal of progress with respect to educational expansion, with the primary aim of reducing educational inequality. However, equitable distribution of educational attainment in the population does not necessarily follow growth of educational opportunity. Overall reductions in inequality depend upon the extent to which certain segments of the population benefit from increases in opportunity. In this paper, we explore whether educational policies aimed at educational expansion also had a strong impact on the reduction of between-group inequality in children's education, as defined by mother's education. We employ the IPUMS micro data census samples from the 1970s, 1980s, 1990s, and 2000s for several LAC. To measure change in inequality over time and across groups, we propose the use of Kullback-Leibler divergence. Then, differences between two distributions – reference and comparison – are synthesized via a single index. We use as reference the distribution of educational attainment among relatively advantaged students aged 8-20: those whose mothers who completed secondary education or more. This distribution is compared to: 1) the attainment distribution of those children aged 8-20 without information about mother's education (e.g., orphans or those of extreme economic disadvantage); 2) the attainment distribution of those children aged 8-20 whose mothers completed less than primary; 3) the attainment distribution of those children aged 8-20 whose mothers completed primary only. Our findings bring attention to a regular regional trend driven by a reduction of educational inequality over time in all countries, for both boys and girls, and especially for groups whose mothers had the lowest levels of education. The downward trajectory of the inequality can be considered as evidence of intergenerational educational mobility, since over time children whose mothers had relatively low educational attainment were closing the gap with children whose mothers had relatively high attainment.

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## 1. Introduction

Over the past four decades, countries in Latin America (LAC) have made a great deal of progress with respect to universalizing primary education, as well as expanding enrollment at subsequent levels of schooling. In many countries, educational reforms and Conditional Cash Transfer programs implemented during this period contributed to an increase in the number of socially disadvantaged children attending school. It was also a period of rapid decentralization, which aimed to delegate resources and responsibility to local provincial authorities who presumably know best to whom to target resources.

To understand the changes brought about by educational expansion, one of the most important dimensions to be analyzed is educational inequality. The growth of educational opportunities may or may not be followed by an improvement in the distribution of this attribute in the population. Overall reductions in inequality depend on the extent to which certain segments of the population – especially children from socioeconomically disadvantaged families – benefit from the increase in opportunity.

Educational inequality is commonly measured by examining traditional indicators among disparate groups, such as average years of schooling, literacy, enrollment and attendance ratios. This is typically the focus of official statistics presented in policy-oriented technical reports (PREAL, 2006; UNESCO, 2006; UNESCO, 2011). Apart from descriptive numbers, a broad range of scientific studies make use of regression methods, where the magnitude of the coefficients measuring family background – generally income and parent's education – are used as a "barometer" to signal differences in educational outcomes among children from distinct social origins (Andersen, 2001; Behrman et al., 2001; Dahan and Gaviria, 2002; Marteleto, 2012). The common characteristic of these studies is that they present group differences in the mean/median or proportion/ratio for the outcome of interest. Recently, attempts have also been made to measure educational inequality based on schooling dispersion, i.e., with a focus on the distributional dimension (Thomas et al. 2001; Castello and Domenech, 2001; World Bank, 2004; Lorel, 2008). Usually, such studies apply the Gini metric, commonly used to measure income inequality, adapting it to the features of educational data.

The present study intends to contribute to this literature, with the primary goal of examining trends in inequality in educational attainment distributions between the 1970s and 2000s for 15 Latin American Countries. Our primary research question is the extent to which educational expansion had an impact on the reduction of inequality between groups, defined according to mother's education. Each of the countries considered took on a number of educational policy reforms to target underrepresented groups during the decades under consideration in the current analysis, and there is no question that such policies led to expanded enrollment; however, there is still an empirical question concerning the extent to which these efforts have corresponded with greater parity in distributions of educational attainment.

This analysis is exceptional in investigating a large sample of Latin American Countries, corresponding to approximately 90% of Latin America's population, and the methodology, which involves calculating educational inequality between groups rather than for the whole population, is unique. To do that, we propose the use of the Kullback-Leiber divergence (KL henceforth), a metric that summarizes the differences between two distributions – reference and comparison – via a single index. Since the unit of analysis is the whole country, and several countries are assessed altogether, a certain degree of generalization is inevitable. Nonetheless, a global comparative framework is essential for demonstrating the general pattern of educational inequality trends in the Latin America region over recent decades.

## 2. Data and Method

### 2.1 Data

We use the International Integrated Public-Use Microdata Series (IPUMS - Minnesota Population Center, 2011) from the 1970s-2000s for 15 Latin American Countries. The data comes from population censuses, and the samples for each country varyingly correspond to between 1 percent and10 percent of the total population. The variables are harmonized in order to allow reliable comparisons among countries, as IPUMS assigns uniform codes across all samples.

The 15 countries selected for this study, the years, and the sample sizes for each year are presented in Table 1:

[Table 1]

## 2.2 Inequality measure

Having as the main goal to compare educational attainment distributions between groups over time and across countries, one of the challenges is to choose, among a wide range of inequality measures, the one that best suits our purpose.

In the educational literature, the Gini index has been the most common metric used to measure inequality in educational attainment distributions (Thomas et al. 2001; Castello and Domenech, 2001; World Bank, 2004; Lorel, 2008). Gini indicates the deviation of the Lorenz curve (cumulative shares of educational attainment to cumulative shares of population) from the absolute equality curve (expressed as a $45^o$ line). However, Gini has some properties that make it unsuitable for this particular analysis. Specifically, it is not suitable for comparing inequalities between groups, since it measures absolute rather than relative inequality. Further, one would never realistically expect absolute equality in education across a population, especially when the subjects under consideration constitute the school-age population, as is the case in the current study. By definition, there will be variation in level of education achieved, since school trajectories have not yet been completed.

Frankema (2008, p.439) also highlights another limitation of the Gini index, specifically that it is "highly sensitive to the percentage share of the population that has received no schooling at all." He notes that according to correlation statistics, the Gini index is essentially a substitute for primary enrollment rates in countries with high proportions of those with no schooling, as is the case of LACs. It is therefore possible that the educational Gini simply reflects the differences between those without any schooling and those with some schooling, rather than the distribution along educational grades.

In order to overcome such limitations, we propose the use of the Kullback-Leibler (KL) divergence to measure educational inequality among the school-age population coming from different social origins. KL synthesizes the differences between two educational attainment distributions through a single index. Given two probability distributions, $p_c$ and $p_r$, the index can be expressed as:

$$KL(p_c||p_r) = \sum_{j=1}^{j=5} p_c(j) * log\left(\frac{p_c(j)}{p_r(j)}\right)$$

Where:

$p_c(j)$ = proportion of population in the comparison group with educational attainment equal to j;

$p_r(j)$ = proportion of population in the reference group with educational attainment equal to j.

This measure is always higher than or equal to zero. Zero means equality between distributions whenever $p_c$ equals $p_r$ for all categories of $j$. The higher the KL index, the greater the distance between $p_c$ and $p_r$.

Also, KL is a superior metric when comparing groups, rather than overall inequality distributions. KL is more versatile because we can contrast the comparison distribution with any other distribution and not only to absolute equality. Moreover, it implicitly takes into account not only enrollment/attendance, but also the outcome of school flow patterns. Late entries or early withdrawals will cause attainment distributions to be skewed to the left, thereby increasing educational inequality.

The analysis is restricted to those aged 8-20, as this population would have been the most affected by education policies implemented during recent decades. They will be distributed into five levels of educational attainment: no education, incomplete primary (incomplete ISCED 1), primary (ISCED 1), lower secondary (ISCED 2), and upper secondary or more (ISCED 3+).

Figure 1 shows the educational attainment distribution for each country by year.

[Figure 1]

### 2.2.1 Group definition: reference and comparison groups

An important consideration when using KL divergence is the choice of the reference and comparison distributions of educational attainment. The choice of a 'reference' group

distribution is somewhat arbitrary and could be any in which one has a substantive interest, or it could be a distribution that arises under 'ideal' circumstances. In this case, the reference would ideally represent the attainment distribution of any school-age population who entered formal schooling at the typical age and progressed through the system without repeating a grade or dropping out. Empirically, a justifiable approach is to use as the reference the distribution of educational attainment among relatively advantaged students, like those with better social economic status. The implicit assumption, presumably, is that socially and economically privileged children experience a satisfactory school trajectory, without unusual rates of repetition and dropout, as they are less likely to experience budget constraints in educational investment and more likely to live in a rich learning environment.

Following this approach, we selected mother's education as our key variable to define the reference and comparison groups. This choice is based on the fact that this variable is commonly and straightforwardly harmonized across contexts, as compared to income, wealth, or composite socioeconomic status, but most importantly, because of how consistently the literature shows that mother's education is among the most important factors for children's schooling outcomes and overall life chances.

We use as reference those children aged 8-20 whose mothers have completed secondary education or more[5]. We will then compare this reference group's attainment distribution to: 1) *comparison 1*: the attainment distribution of those aged 8-20 without information about mother's education (in effect, those with no mother in the household, e.g., orphans or those of extreme economic disadvantage); 2) *comparison 2*: the attainment distribution of those aged 8-20 whose mothers completed less than primary; 3) *comparison 3*: the attainment distribution of those aged 8-20 whose mothers completed primary or lower secondary.

To examine whether children assigned to the reference group have better educational outcomes, we calculated the average age-grade gap of each group,[6] which is shown in Table 2 as the average number of years difference between age and expected age-for-grade. As presumed, the average age-grade gap of children whose mothers are highly educated is

[5] Preliminary analyses explored using as reference those whose mothers had completed tertiary education, but in some countries and especially at earlier time points, the sample size was too small or unstable to be useful.

[6] It is calculated using the following equation:
$gap = age - primary\ school\ starting\ age - completed\ years\ of\ schooling$. Information about primary school starting age was obtained from the World Bank website (http://data.worldbank.org/indicator/SE.PRM.AGES).

notably lower than those observed for the other groups. Argentina, Chile and, surprisingly, Nicaragua show the lowest averages for the reference group. The average age-grade gap increases gradually from the least to the most disadvantaged children. It is notable that repetition and dropout are a critical problem in all Latin American countries, especially for those children who do not live with their mothers. Brazil stands as the country with the worst indicators. By 1970, Brazilian children aged 8-20 with no mother in the household were approximately 6.6 years late in their school trajectory. By the year 2000, the average was still high, at around 4 years.

[Table 2]

Table 3 shows the share of children aged 8-20 by group for each country. It is evident that mothers' education has been increasing over time in all countries, as the share of those with more highly educated mothers grew from less than 5 percent to more than 10 percent, depending on the country. On one end of the spectrum, Puerto Rico had the highest proportion of children whose mothers have secondary education or more in all four decades, followed by Chile and Uruguay. On the other end, Nicaragua and Venezuela show the slowest-changing pattern. Another notable feature is that the proportion in the Comparison 1 group (those without household mothers) has declined over time, reflecting a previous finding in the literature that young people are moving out of their parents' home at increasingly older ages. This is especially the case of those whose parents are economically well-off. Children may be choosing to remain in their parents' home to maintain a certain standard of living while completing their studies and establishing themselves financially.

[Table 3]

The time point to use for the reference group's distribution is also an important consideration. One justifiable option is to generate a reference distribution for each time-point of comparison. Another reasonable option is to use the reference group's distribution from the latest time-point for all comparisons across time. Both offer interesting conclusions concerning levels of inequality between reference and comparison groups – the first option providing information about how comparison groups fared relative to the reference group's own changing position over time, and the second regarding how the comparison groups fared according to the reference group's most recent position. Since both methods are useful, we ran the analysis both ways and commented on the different conclusions.

## 2.3 Age-standardization

It is important to note that the age distribution of those four groups could be different either because of fertility differentials by mother's education (due to quantum and timing) or the higher probability to live in a household without parents among the oldest. In fact, Table 4 shows that the average age of Comparison 1 group (those without household mothers) is at least one and half years higher than the other groups across all countries and years. Similarly, but in the opposite direction, the average age of the Reference group is typically lower than the comparison groups.

[Table 4]

Age composition influences the distribution of educational attainment, as "old" children are more likely to have reached higher levels of education than "young" children. Therefore, to minimize the effect of different age profiles,[7] we apply an age-standardization method, imposing a flat age distribution across all groups (i.e., equal shares at each age) by re-weighting the population under analysis by a flat standard age distribution. [8] The first step is to calculate the weighting factors, which are given by:

$$w_a = \frac{p_a}{p_a^s}$$

Where $w_a$ is the weighting factor at age $a$; $p_a$ is the proportion of the population that will be standardized at age $a$; $p_a^s$ is the proportion of the standard population at age $a$. The second step is to apply the weighting factors to the distribution of educational attainment:

$$p_{a,j}^* = \frac{p_{a,j}}{w_a}$$

Where $p_{a,j}^*$ is the standardized proportion of children aged $a$ with educational attainment $j$; and $p_{a,j}$ is the observed proportion of children aged $a$ with educational attainment $j$. Then, the standardized distribution of educational attainment will be:

[7] To see how age composition might affect educational statistics, see Barakat et al. (2012).

[8] The analyses were also performed after standardizing all groups' age distributions to that of the total real age distribution for the population aged 8-20 by sex. The results are quite similar between real age distribution and flat age distribution. Finally, a 'flat' approach was chosen because the standard will be the same for all countries, which is essential for comparison purposes.

$$d^* = \sum_{a=8}^{a=20} p_j^* \qquad for\ j = 1, \dots, 5$$

By using the same standard age distribution for two populations, the remaining differences between estimates may be attributed only to differences in the performance of the educational system.

**3. Findings**

The set of graphs in Figure 2 shows the results for Reference vs. Comparison1: no household mother; graphs in Figure 3 shows the results for Reference vs. Comparison 2: mothers < primary; and Figure 4 shows the results for Reference vs. Comparison 3: mothers ≥ primary. For each comparison, there are two graphs, A and B. Graph A depicts the inequality index using the reference distribution for each time point. Graph B shows the results when inequality is calculated using the reference group's distribution from the latest time point.

Approach A can be interpreted as a measure of inequality without respect to time, or the distance between the disadvantaged children and the advantaged ones in terms of educational attainment at any particular time point. Approach B can be understood as a measure of overall improvement, as the reference distribution is held constant for all comparisons across time. We will focus on results from approach A, and when it is interesting, we will contrast them with the results from approach B.

In general, inequality decreased in all countries from the early 1970s onward, for both male and female children. This means that over time children without mothers or those whose mothers had no formal schooling, or very little, were closing the education gap with children with well-educated mothers. We also find that for all sets of results, relative inequality was lower between the Reference group and those whose mothers had completed primary (Comparison 3) than between Reference and those with no household mothers (Comparison 1) or those with mothers who did not finish primary (Comparison 2).

At the beginning of the historical series, Argentina, Chile, Costa Rica, Puerto Rico and Uruguay showed lower initial starting levels of inequality. This set of countries was the first to invest in mass education in the Latin American region, doing so during the last decades of the 19th century (Frankema, 2009). Therefore, by the 1970's they had already accomplished universal access to primary education and had witnessed an expansion of enrollment at subsequent levels. As some convergence in the distribution of education is endogenous to the timing of the expansion process, the early movement towards mass education can explain the relatively low level of inequality between children coming from different social origins at that fixed point in time.

Nicaragua and Brazil had the highest levels of inequality in the earlier decades, followed by Bolivia, Colombia, Ecuador, Mexico and Venezuela. Certain factors, like a strong colonial heritage that led to a very stratified society characterized by high levels of ethnic heterogeneity, a large rural population and a powerful elite - who opposed schooling the masses at the taxpayer's expense -, contributed to a delay in universalized education, relative to more progressive Latin American Countries (Frankema, 2009; Lindert 2010).

Regarding the pace of inequality reduction, the sharpest visible decline occurred during the decade between the early 1970s and the early 1980s, especially for those countries with higher inequality indices - Brazil, Colombia, Ecuador, Panama and Venezuela.[9] The rapid convergence during this decade may be a function of the available population to be educated and the low starting levels of educational attainment. Prior to the 1970s, greater emphasis was being placed on quality, technology development, and the expansion of higher education opportunities, as opposed to expanding opportunity. After 1970 however, greater attention was turned towards efforts at universal primary enrollment, expanding enrollment in lower secondary, and to adult education and basic literacy for all (Arnove, Torres, Franz, and Morse, 1996). Particularly in Brazil, one of the countries with the sharpest decline, the change of compulsory education law from four to eight years in 1971 may also explain this trend.

From 1980s onwards, a slow pace of convergence between Reference and Comparison 1, as well Comparison 2, was observed in almost all countries. In addition to the fact that the range limits for inequality reduction had diminished, The poorer school outcomes for the youth

[9] There is no information about inequality in the 1980's for Bolivia, El Salvador, Mexico and Nicaragua.

were probably associated with the economic crisis that hit those countries in the 1980's (Duryea at al., 2007; Burton, 2008; Torche, 2010; Marteleto et al., 2012). Those with the highest economic disadvantage would have been more likely to drop out of school to work and help their families. The resulting impact on school flow is reflected in the educational attainment distribution, which ultimately slowed the pace of convergence between children from different socioeconomic backgrounds.

In some countries, such as Uruguay (Figures 1 and 2) and Panama (Figure 2), educational inequality actually *increased* between the 1980s and 1990s. For this same time period, Marteleto et al. (2012) suggested that in several Latin American countries, there was a reinforcement of the importance of family background as measured by mother's education on children's educational outcomes, which led to an increase in educational inequality.

Brazil seems to be the country where inequality continuously fell in both Figures 1 and 2, Graph A (reference is each time point). However, it is worth comparing the results with those in Graph B (reference is the last time point), where the downward trend appears stalled. From a perspective of social justice, the 1980's were a picture of success, as the more disadvantaged children were catching up faster with the most advantaged children (Graph A). But, if we consider overall improvement in the educational attainment distribution (Graph B), the results may indicate that the convergence toward more balanced attainment distribution between groups occurred at the expense of a reduction in the aggregate level of education.

The 1990s-2000s decade was characterized by a re-focusing of efforts toward extending opportunities for the most disadvantaged, *i.e.*, those who had been persistently excluded from the educational system even after the expansion wave. In Brazil in particular, a number of well-known efforts were launched: FUNDEF, which more equitably distributed national and municipal funding reserved for education, as well as renewed efforts toward universal primary completion (Rios-Neto and Guimaraes, 2010). Brazil's efforts were similar to those of other LACs during this time. We find evidence of the success of these efforts in our results, as the figures show a continued reduction in educational inequality during that decade.

## 4. Final remarks

This study has examined inequality trends in educational attainment distributions of the school-age population for fifteen Latin American Countries. We have compared the dispersion of schooling among children from mothers with different levels of education and summarized the differences between them by a single index using the Kullback-Leibler metric. Using educational attainment shares instead of process-specific measures (e.g., enrollment or attendance), we have also implicitly captured the effect of irregular school flows on educational inequality between the 1970s and 2000s.

Our findings bring attention to a regular regional trend characterized by a reduction in educational inequality over time in all countries considered, for both boys and girls, but especially for groups whose mothers had the lowest levels of education. Cross-national differences in the level and shape of inequality trends can largely be explained by the timing differences of the expansion process. In the earliest decades, Argentina, Chile, Uruguay and Costa Rica were the least unequal countries due to their early investments in mass education and, therefore, those countries show a smoother decline. Nicaragua and Brazil, highlighted as the most unequal countries, had the sharpest decline but especially between 1970 and 1980. By the 2000s, most of the countries had reached similar and relatively low levels of educational inequality.

The downward-sloping shape of the inequality curves can be considered evidence of intergenerational educational mobility, since over time children whose mothers had relatively low educational attainment were closing the gap with children whose mothers had relatively high attainment. In other words, this transition means that recent cohorts of students with lower-educated mothers are reaching a higher level of education, relative to their counterparts in the past. The reduction in importance of social class origins over recent decades is also corroborated in other studies (Marteleto et al, 2012). If mother's education no longer has as strong an impact on children's education, what then is driving the observed increase in educational attainment among those from less educated family backgrounds?

According to the meritocratic hypothesis (Marshal et al, 1997), as school institutions become more democratic, and access depends less on native families' geographic location or economic standing, the success of an individual in progressing educationally will be more merit-dependent than social origin-dependent. In this case, efforts toward expanding schooling seem to have played a crucial role in effecting the historical shift from high to low

educational inequality among children in the Latin American region. Once a child has the opportunity to be enrolled, his/her chance to complete at least one year of education is inevitably higher than one who does not have this opportunity.

Moreover, many countries have undergone major structural reforms during the decades covered in this study. Particularly in Brazil, one of the countries that showed the strongest inequality reduction, policies with respect to educational improvement included programs to increase both the supply and demand for education. At the starting point, the 19070s were characterized by top-down supply-driven programs, such as the implementation of a law that made school mandatory for all children aged 7-14 (the previous law only required schooling for children aged 7-10) and a corresponding investment in construction of new schools in order to support new entrants. By the 1980s, investments in education stalled, and a number of studies have shown evidence of a close relationship between the deep economic crisis (faced by Brazil and many other LAC) and poor educational outcomes (Duryea et al, 2007; Torche, 2010; Marteleto, 2012). Our figures also show a slow pace of inequality reduction during that decade. From the mid-1990's onward, sustained educational policies, which were mantained and improved even after the Brazilian governement transition in 2003, served to extend school to even the poorest children. Perhaps the most influential programs were FUNDEF (Fund for the Maintenance and Develpment of Basic Education and Teacher Appreciation), an education finance equalization strategy that increased expenditures in the poorest Brazilian regions (North and Northeast), and Conditional Cash Transfer Programs. Conditional transfer programs were widespread in many other Latin American countries by the 1990's and have been shown to have had a positive impact on enrollment and attendance ratios (Oliveira et al, 2007).

Results from the current study confirm the importance of efforts that not only focus on improving quality, but equality in access, as well. Without full participation in a population, efforts to improve quality for the select few who are able to benefit will likely have limited impact on overall educational attainment improvement. Therefore, expanding enrollment opportunities for the most socially disadvantaged or geographically remote children seems to be the first step toward having an overall well-educated population. In the long term, educational expansion will also have indirect distributive effects through the intergenerational transmission of human capital. As earlier cohorts achieve higher educational attainment, the

rise of educational attainment across future cohorts is straightforward, given the premise that better educated parents have increasingly better educated children.

Some limitations in this analysis should be noted. As each country has its own reference distribution, it would not be appropriate to compare inequality across countries. Brazil would have higher inequality if the Argentinean reference was used, for example. Also, the reference distribution does not reflect an ideal circumstance in some countries. Although some countries have relatively healthy school-flows, as indicated by the average age-grade gap, others do not. These problems could be addressed by adopting a reference distribution that best represents an ideal school-flow (i.e., a distribution unaffected by age profile), and applying it to all countries under consideration. However, comparing countries' distributions to a hypothetical distribution is rather a different empirical question than that addressed here, that being whether overall inequality within LAC countries has improved, given the distribution of attainment that exists in reality.

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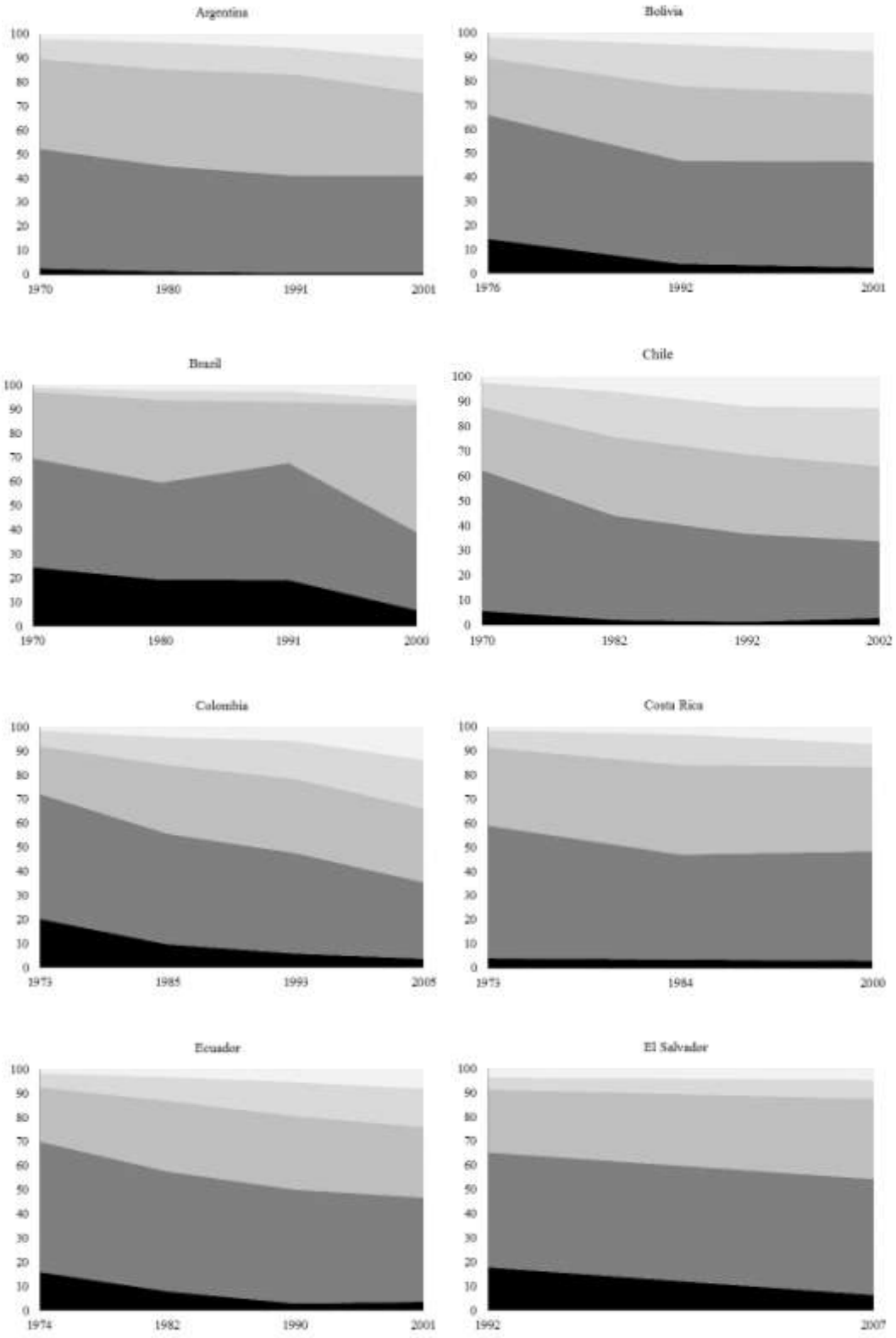
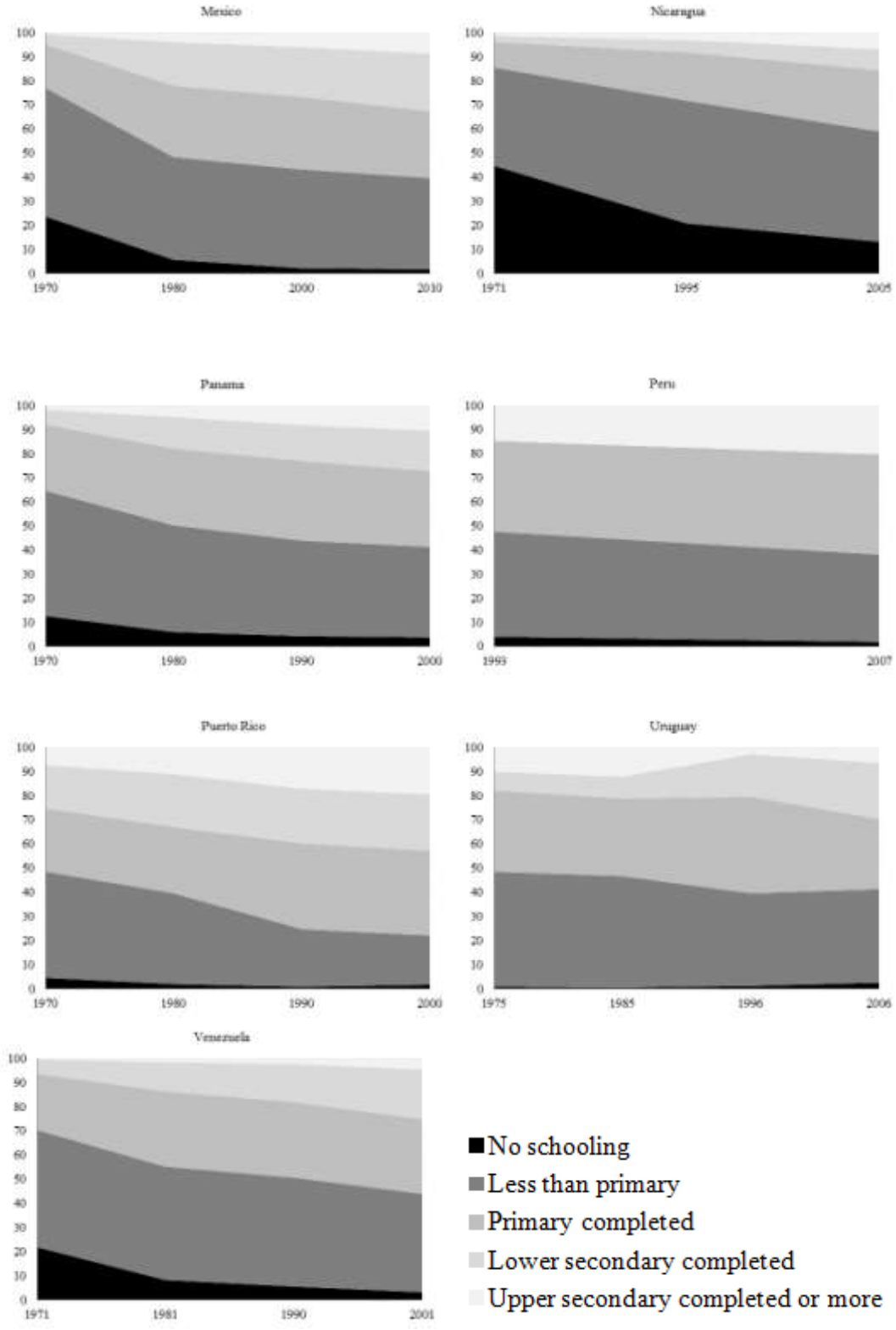
**Table 1. Selected countries and sample size, by year**

| Argentina | N | Colombia | N | Mexico | N | Puerto Rico | N |
|---|---|---|---|---|---|---|---|
| 1970 | 112.025 | 1973 | 683.704 | 1970 | 152.888 | 1970 | 8.059 |
| 1980 | 651.308 | 1985 | 791.035 | 1990 | 2.619.872 | 1980 | 43.470 |
| 1991 | 1.073.602 | 1993 | 901.067 | 2000 | 2.944.518 | 1990 | 43.494 |
| 2001 | 864.626 | 2005 | 1.059.583 | 2010 | 3.315.231 | 2000 | 40.008 |
| Bolivia | N | Costa Rica | N | Nicaragua | N | Uruguay | N |
| 1976 | 138.291 | 1973 | 65.433 | 1971 | 63.910 | 1975 | 63.570 |
| 1992 | 193.704 | 1984 | 71.603 | 1995 | 144.050 | 1985 | 64.533 |
| 2001 | 249.212 | 2000 | 106.392 | 2005 | 163.863 | 1996 | 68.124 |
| | | | | | | 2006 | 57.205 |
| Brazil | N | Ecuador | N | Panama | N | Venezuela | N |
| 1970 | 1.539.320 | 1974 | 206.314 | 1970 | 45.179 | 1971 | 369.148 |
| 1980 | 1.722.847 | 1982 | 248.475 | 1980 | 62.000 | 1981 | 445.142 |
| 1991 | 2.472.207 | 1990 | 299.934 | 1990 | 66.323 | 1990 | 543.307 |
| 2000 | 2.760.675 | 2001 | 337.364 | 2000 | 72.747 | 2001 | 632.879 |
| Chile | N | El Salvador | N | Peru | N | | |
| 1970 | 267.993 | 1992 | 162.140 | 1993 | 657.106 | | |
| 1982 | 328.618 | 2007 | 168.845 | 2007 | 734.142 | | |
| 1992 | 317.300 | | | | | | |
| 2002 | 350.000 | | | | | | |

Source: IPUMS.

**Figure 1. Educational attainment distributions (%) of children aged 8-20**




Mexico
Nicaragua
Panama
Peru
Puerto Rico
Uruguay
Venezuela
No schooling
Less than primary
Primary completed
Lower secondary completed
Upper secondary completed or more

## Table 2. Average age-grade gap of children aged 8-20, by group

| Group Definition | Argentina | | | | Bolivia | | | | Brazil | | | | Chile | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1970 | 1980 | 1991 | 2001 | 1976 | 1980s | 1992 | 2001 | 1970 | 1980 | 1991 | 2000 | 1970 | 1982 | 1992 | 2002 |
| C1: no HH mother | 4.51 | 3.52 | 2.78 | 2.81 | 5.41 | - | 3.73 | 2.72 | 6.64 | 5.85 | 5.07 | 3.93 | 4.25 | 2.98 | 2.16 | 1.34 |
| C2: mothers < primary | 2.79 | 2.28 | 2.17 | 2.35 | 3.60 | - | 2.39 | 1.85 | 4.43 | 4.10 | 3.90 | 3.16 | 3.14 | 2.30 | 1.82 | 1.34 |
| C3: mothers ≥ primary | 0.98 | 0.70 | 0.73 | 1.31 | 1.06 | - | 0.95 | 0.86 | 2.13 | 2.18 | 2.00 | 1.53 | 1.58 | 0.91 | 0.62 | 0.37 |
| R: mothers ≥ secondary | 0.13 | -0.01 | 0.05 | 0.72 | 0.47 | - | 0.08 | 0.23 | 0.73 | 0.75 | 0.70 | 0.57 | 0.44 | 0.20 | 0.00 | 0.04 |
| **Group Definition** | **Colombia** | | | | **Costa Rica** | | | | **Ecuador** | | | | **El Salvador** | | | |
| | 1973 | 1985 | 1993 | 2005 | 1973 | 1984 | 1990s | 2000 | 1974 | 1982 | 1990 | 2001 | 1970s | 1980s | 1992 | 2007 |
| C1: no HH mother | 5.90 | 5.22 | 4.31 | 3.03 | 4.78 | 4.14 | - | 4.51 | 5.30 | 4.38 | 3.48 | 3.09 | - | - | 3.80 | 2.24 |
| C2: mothers < primary | 4.39 | 4.08 | 3.45 | 2.71 | 2.81 | 3.10 | - | 3.14 | 3.73 | 2.95 | 2.51 | 2.52 | - | - | 2.53 | 1.68 |
| C3: mothers ≥ primary | 2.68 | 2.40 | 1.60 | 1.09 | 1.36 | 1.45 | - | 1.91 | 1.44 | 1.20 | 1.00 | 1.06 | - | - | 0.50 | 0.36 |
| R: mothers ≥ secondary | 1.49 | 1.22 | 0.77 | 0.26 | 0.66 | 0.60 | - | 1.03 | 0.45 | 0.33 | 0.31 | 0.32 | - | - | -0.34 | -0.26 |
| **Group Definition** | **Mexico** | | | | **Nicaragua** | | | | **Panama** | | | | **Peru** | | | |
| | 1970 | 1980 | 2000 | 2010 | 1971 | 1980s | 1995 | 2005 | 1970 | 1980 | 1990 | 2000 | 1970s | 1980s | 1993 | 2007 |
| C1: no HH mother | 6.95 | 4.01 | 3.61 | 3.50 | 6.00 | - | 4.40 | 3.50 | 4.87 | 3.57 | 3.30 | 2.78 | - | - | 3.03 | 2.03 |
| C2: mothers < primary | 4.15 | 2.57 | 2.32 | 2.62 | 4.06 | - | 3.17 | 2.62 | 3.53 | 2.65 | 2.84 | 2.68 | - | - | 2.01 | 1.51 |
| C3: mothers ≥ primary | 1.86 | 1.11 | 0.93 | 0.47 | 0.98 | - | 0.80 | 0.47 | 1.71 | 1.03 | 0.98 | 0.92 | - | - | 0.55 | 0.59 |
| R: mothers ≥ secondary | 1.96 | 0.63 | 0.37 | -0.57 | -0.18 | - | -0.26 | -0.57 | 0.70 | 0.30 | 0.14 | 0.12 | - | - | 0.07 | 0.26 |
| **Group Definition** | **Puerto Rico** | | | | **Uruguay** | | | | **Venezuela** | | | | | | | |
| | 1970 | 1980 | 1990 | 2000 | 1975 | 1985 | 1996 | 2006 | 1971 | 1981 | 1990 | 2001 | | | | |
| C1: no HH mother | 2.54 | 2.00 | - | - | 3.39 | 2.84 | 3.49 | 2.70 | 5.65 | 4.48 | 4.00 | 3.04 | | | | |
| C2: mothers < primary | 2.15 | 1.75 | - | - | 2.00 | 1.77 | 2.94 | 1.60 | 3.80 | 3.08 | 3.14 | 2.69 | | | | |
| C3: mothers ≥ primary | 1.15 | 1.00 | - | - | 1.04 | 0.98 | 1.83 | 1.60 | 1.86 | 1.28 | 1.20 | 1.08 | | | | |
| R: mothers ≥ secondary | 0.55 | 0.49 | - | - | 0.43 | 0.57 | 0.93 | 0.83 | 0.98 | 0.45 | 0.43 | 0.30 | | | | |

Source: IPUMS.

## Table 3. Distribution (%) of children aged 8-20 by group

| Group Definition | Argentina | | | | Bolivia | | | | Brazil | | | | Chile | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1970 | 1980 | 1991 | 2001 | 1976 | 1980s | 1992 | 2001 | 1970 | 1980 | 1991 | 2000 | 1970 | 1982 | 1992 | 2002 |
| C1: no HH mother | 21.43 | 20.53 | 15.42 | 12.19 | 29.98 | - | 27.66 | 29.85 | 17.32 | 15.41 | 14.23 | 15.36 | 22.83 | 20.79 | 18.99 | 17.92 |
| C2: mothers < primary | 44.35 | 35.72 | 23.44 | 16.08 | 57.85 | - | 40.01 | 37.25 | 64.08 | 56.66 | 43.88 | 38.48 | 44.75 | 37.48 | 22.45 | 12.33 |
| C3: mothers ≥ primary | 32.37 | 40.38 | 51.41 | 45.19 | 9.15 | - | 19.40 | 20.73 | 16.78 | 24.21 | 32.46 | 31.08 | 27.88 | 33.83 | 40.45 | 38.62 |
| R: mothers ≥ secondary | 1.30 | 3.36 | 9.24 | 26.54 | 1.83 | - | 6.71 | 11.38 | 1.79 | 3.64 | 9.43 | 15.08 | 4.54 | 7.91 | 18.11 | 31.14 |
| Missing | 0.56 | 0.00 | 0.48 | 0.00 | 1.18 | - | 6.21 | 0.79 | 0.02 | 0.08 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Total population | 5,601,250 | 6,333,612 | 8,059,551 | 8,646,260 | 1,382,910 | - | 1,937,040 | 2,492,120 | 29,585,865 | 36,056,790 | 42,025,909 | 45,355,256 | 2,679,930 | 3,286,180 | 3,173,000 | 3,500,000 |
| **Group Definition** | **Colombia** | | | | **Costa Rica** | | | | **Ecuador** | | | | **El Salvador** | | | |
| | 1973 | 1985 | 1993 | 2005 | 1973 | 1984 | 1990s | 2000 | 1974 | 1982 | 1990 | 2001 | 1970s | 1980s | 1992 | 2007 |
| C1: no HH mother | 25.93 | 21.26 | 22.11 | 19.17 | 16.42 | 16.68 | - | 12.98 | 24.58 | 22.96 | 22.45 | 23.95 | - | - | 31.42 | 20.82 |
| C2: mothers < primary | 51.65 | 45.82 | 35.48 | 25.23 | 62.55 | 47.89 | - | 21.14 | 56.13 | 47.17 | 38.70 | 30.16 | - | - | 47.42 | 45.13 |
| C3: mothers ≥ primary | 19.19 | 25.63 | 30.77 | 33.07 | 18.72 | 30.78 | - | 45.78 | 16.60 | 21.21 | 27.78 | 30.23 | - | - | 14.79 | 21.67 |
| R: mothers ≥ secondary | 1.64 | 5.43 | 9.99 | 21.47 | 2.31 | 4.65 | - | 20.10 | 1.68 | 3.91 | 9.17 | 15.34 | - | - | 5.86 | 12.37 |
| Missing | 1.58 | 1.85 | 1.66 | 1.06 | 0.00 | 0.00 | - | 0.00 | 1.02 | 4.75 | 1.89 | 0.32 | - | - | 0.51 | 0.00 |
| Total population | 6,837,040 | 8,241,246 | 9,010,670 | 10,637,310 | 654,330 | 716,030 | - | 1,063,920 | 2,069,514 | 2,484,750 | 2,999,340 | 3,373,640 | - | - | 1,621,400 | 1,688,450 |
| **Group Definition** | **Mexico** | | | | **Nicaragua** | | | | **Panama** | | | | **Peru** | | | |
| | 1970 | 1980 | 2000 | 2010 | 1971 | 1980s | 1995 | 2005 | 1970 | 1980 | 1990 | 2000 | 1970s | 1980s | 1993 | 2007 |
| C1: no HH mother | 16.31 | 15.76 | 13.33 | 13.47 | 22.38 | - | 21.62 | 20.86 | 27.07 | 21.89 | 24.09 | 22.84 | - | - | 24.79 | 23.07 |
| C2: mothers < primary | 69.53 | 51.73 | 33.89 | 21.15 | 66.39 | - | 55.64 | 46.68 | 46.71 | 38.25 | 26.89 | 18.42 | - | - | 44.02 | 31,55 |
| C3: mothers ≥ primary | 13.18 | 27.49 | 37.25 | 46.63 | 8.27 | - | 16.79 | 21.75 | 22.34 | 31.90 | 31.41 | 34.81 | - | - | 13.43 | 16,11 |
| R: mothers ≥ secondary | 0.97 | 5.02 | 11.54 | 18.53 | 1.06 | - | 5.96 | 10.41 | 3.85 | 7.67 | 16.52 | 23.77 | - | - | 16.54 | 29,28 |
| Missing | 0.01 | 0.00 | 3.99 | 0.22 | 1.90 | - | 0.00 | 0.30 | 0.02 | 0.28 | 1.08 | 0.15 | - | - | 1.21 | 0.00 |
| Total population | 15,288,800 | 26,198,720 | 27,499,751 | 28,675,591 | 639,100 | - | 1,440,500 | 1,638,630 | 451,790 | 620,000 | 663,230 | 727,470 | - | - | 6,571,060 | 7,341,420 |
| **Group Definition** | **Puerto Rico** | | | | **Uruguay** | | | | **Venezuela** | | | | | | | |
| | 1970 | 1980 | 1990 | 2000 | 1975 | 1985 | 1996 | 2006 | 1971 | 1981 | 1990 | 2001 | | | | |
| C1: no HH mother | 17.92 | 14.58 | 12.51 | 13.09 | 21.87 | 19.16 | 18.52 | 10.84 | 23.32 | 21.13 | 20.49 | 19.17 | | | | |
| C2: mothers < primary | 40.39 | 23.91 | 7.59 | 2.77 | 37.97 | 25.53 | 16.12 | 19.05 | 54.67 | 47.39 | 31.61 | 19.84 | | | | |
| C3: mothers ≥ primary | 26.38 | 31.58 | 28.25 | 18.44 | 32.65 | 41.10 | 54.39 | 42.96 | 17.30 | 29.43 | 36.93 | 49.75 | | | | |
| R: mothers ≥ secondary | 15.31 | 29.94 | 51.65 | 65.71 | 7.28 | 14.05 | 10.43 | 27.15 | 0.40 | 2.05 | 5.49 | 10.91 | | | | |
| Missing | 0.00 | 0.00 | 0.00 | 0.00 | 0.23 | 0.16 | 0.53 | 0.00 | 4.31 | 0.00 | 5.47 | 0.33 | | | | |
| Total population | 805,900 | 869,400 | 862,659 | 801,223 | 635,700 | 645,330 | 681,240 | 665,91 | 3,491,778 | 4,451,420 | 5,326,056 | 6,328,790 | | | | |

Source: IPUMS.

## Table 4. Average age of children aged 8-20 by group

| Group Definition | Argentina | | | | Bolivia | | | | Brazil | | | | Chile | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1970 | 1980 | 1991 | 2001 | 1976 | 1980s | 1992 | 2001 | 1970 | 1980 | 1991 | 2000 | 1970 | 1982 | 1992 | 2002 |
| C1: no HH mother | 15.62 | 15.64 | 15.77 | 15.95 | 15.60 | - | 15.38 | 15.33 | 15.92 | 16.12 | 16.02 | 16.09 | 15.34 | 15.70 | 15.78 | 15.68 |
| C2: mothers < primary | 13.46 | 13.44 | 13.57 | 13.88 | 12.93 | - | 12.93 | 13.05 | 13.23 | 13.41 | 13.55 | 13.95 | 12.95 | 13.82 | 14.24 | 14.08 |
| C3: mothers ≥ primary | 13.39 | 13.21 | 13.23 | 13.49 | 12.93 | - | 12.59 | 12.78 | 13.18 | 13.49 | 13.08 | 13.64 | 12.97 | 13.47 | 13.44 | 13.47 |
| R: mothers ≥ secondary | 12.71 | 12.83 | 12.85 | 13.51 | 13.05 | - | 12.61 | 13.07 | 13.04 | 13.36 | 12.69 | 13.68 | 12.94 | 13.07 | 12.95 | 13.15 |
| **Group Definition** | **Colombia** | | | | **Costa Rica** | | | | **Ecuador** | | | | **El Salvador** | | | |
| | 1973 | 1985 | 1993 | 2005 | 1973 | 1984 | 1990s | 2000 | 1974 | 1982 | 1990 | 2001 | 1970s | 1980s | 1992 | 2007 |
| C1: no HH mother | 15.08 | 15.66 | 15.36 | 15.55 | 15.91 | 15.93 | - | 16.38 | 15.33 | 15.55 | 15.47 | 15.41 | - | - | 14.95 | 14.80 |
| C2: mothers < primary | 12.83 | 13.63 | 13.50 | 13.65 | 13.07 | 14.03 | - | 13.62 | 12.89 | 13.07 | 13.33 | 13.64 | - | - | 13.34 | 13.53 |
| C3: mothers ≥ primary | 13.13 | 13.52 | 13.09 | 13.41 | 12.83 | 13.08 | - | 13.31 | 13.00 | 13.05 | 13.01 | 13.16 | - | - | 13.01 | 13.13 |
| R: mothers ≥ secondary | 13.05 | 12.89 | 12.81 | 12.96 | 12.69 | 12.88 | - | 13.48 | 12.77 | 12.83 | 12.67 | 13.99 | - | - | 13.10 | 13.10 |
| **Group Definition** | **Mexico** | | | | **Nicaragua** | | | | **Panama** | | | | **Peru** | | | |
| | 1970 | 1980 | 2000 | 2010 | 1971 | 1980s | 1995 | 2005 | 1970 | 1980 | 1990 | 2000 | 1970s | 1980s | 1993 | 2007 |
| C1: no HH mother | 16.17 | 15.88 | 16.24 | 16.03 | 15.41 | - | 15.28 | 15.43 | 15.34 | 15.46 | 15.53 | 15.58 | - | - | 15.55 | 15.72 |
| C2: mothers < primary | 12.88 | 13.56 | 13.80 | 14.11 | 12.82 | - | 13.16 | 13.62 | 12.85 | 13.16 | 13.63 | 13.42 | - | - | 13.27 | 13.63 |
| C3: mothers ≥ primary | 12.92 | 13.22 | 13.17 | 13.48 | 12.92 | - | 12.80 | 13.24 | 12.61 | 12.97 | 13.28 | 13.26 | - | - | 13.00 | 13.11 |
| R: mothers ≥ secondary | 12.89 | 12.99 | 13.00 | 13.48 | 12.44 | - | 12.59 | 13.41 | 12.42 | 12.84 | 13.03 | 13.31 | - | - | 13.03 | 13.31 |
| **Group Definition** | **Puerto Rico** | | | | **Uruguay** | | | | **Venezuela** | | | | | | | |
| | 1970 | 1980 | 1990 | 2000 | 1975 | 1985 | 1996 | 2006 | 1971 | 1981 | 1990 | 2001 | | | | |
| C1: no HH mother | 15.02 | 15.97 | 16.16 | 16.11 | 15.61 | 15.72 | 15.97 | 15.65 | 15.54 | 15.71 | 15.58 | 15.44 | | | | |
| C2: mothers < primary | 13.66 | 14.33 | 14.75 | 14.97 | 13.50 | 13.49 | 14.03 | 13.65 | 12.95 | 13.47 | 13.57 | 13.62 | | | | |
| C3: mothers ≥ primary | 12.97 | 13.45 | 13.75 | 13.98 | 13.44 | 13.16 | 13.43 | 13.53 | 12.88 | 12.97 | 13.00 | 13.28 | | | | |
| R: mothers ≥ secondary | 12.91 | 12.95 | 13.21 | 13.57 | 12.89 | 12.81 | 13.41 | 13.89 | 12.66 | 12.69 | 12.86 | 13.26 | | | | |

Source: IPUMS.

**Figure 2. Educational inequality between Reference (mothers ≥ secondary) and Comparison 1 (no HH mother)**

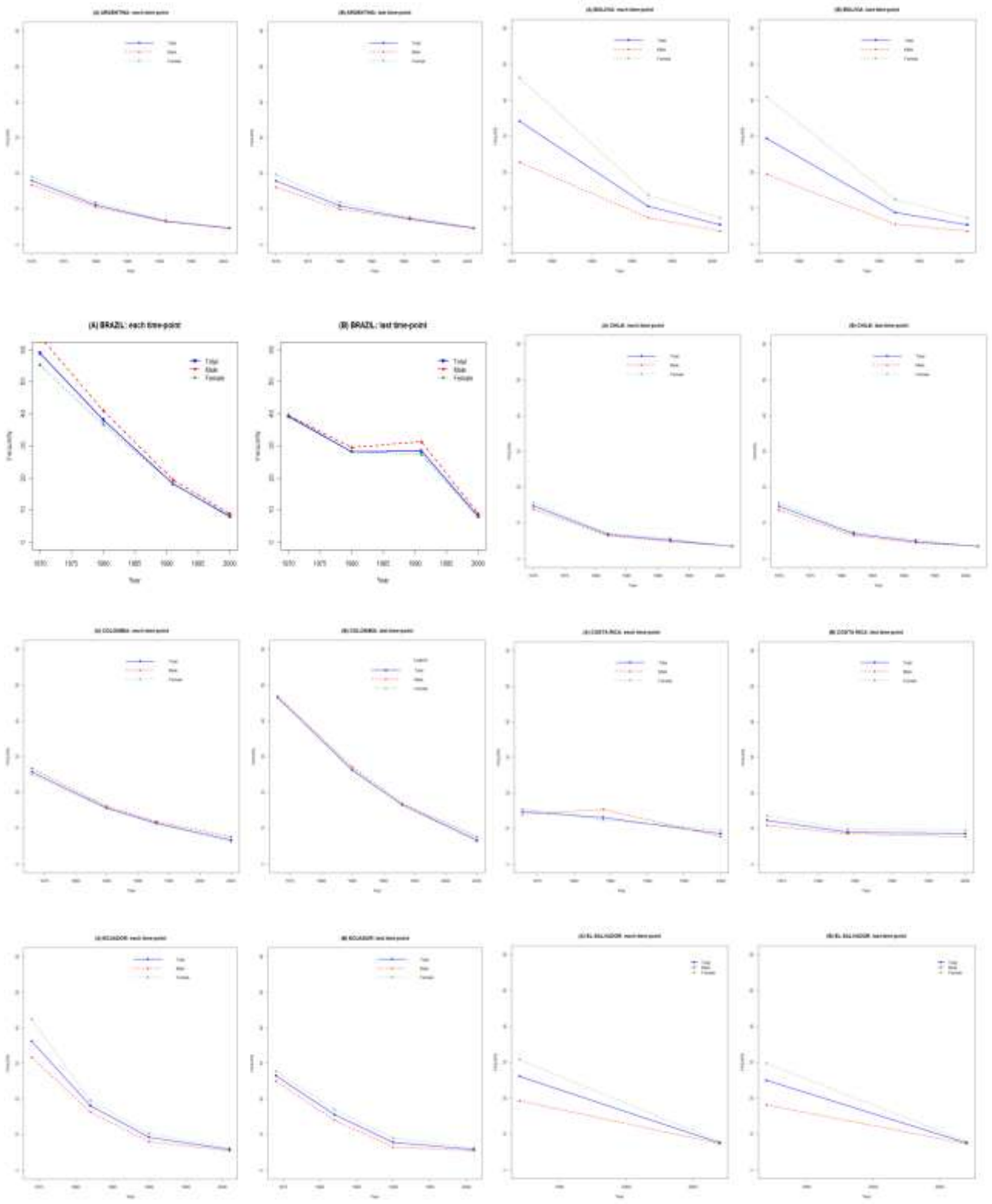


**Figure 2 (continued)**

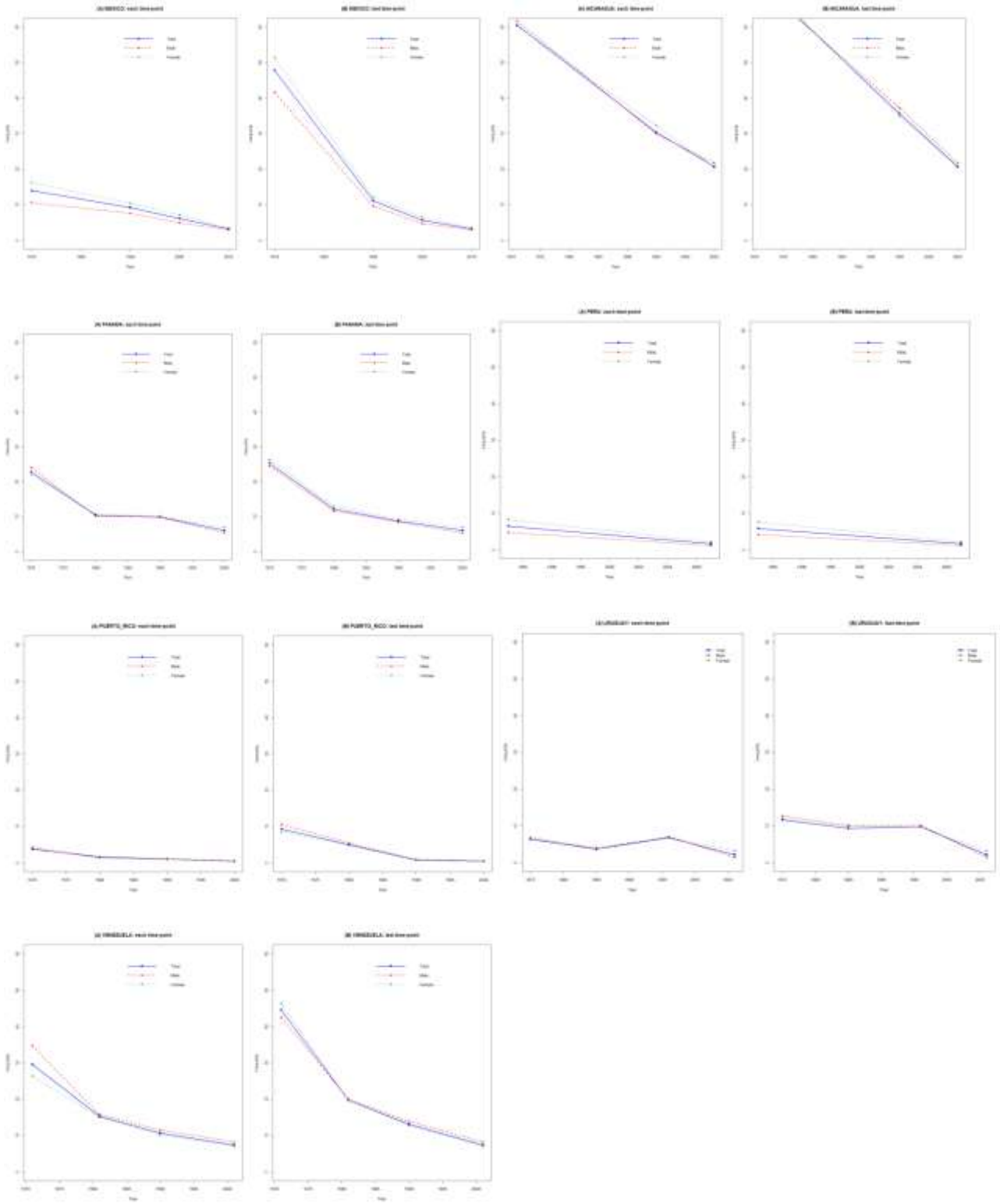


**Figure 3. Educational inequality between Reference (mothers ≥ secondary) and Comparison 2 (mothers < primary)**

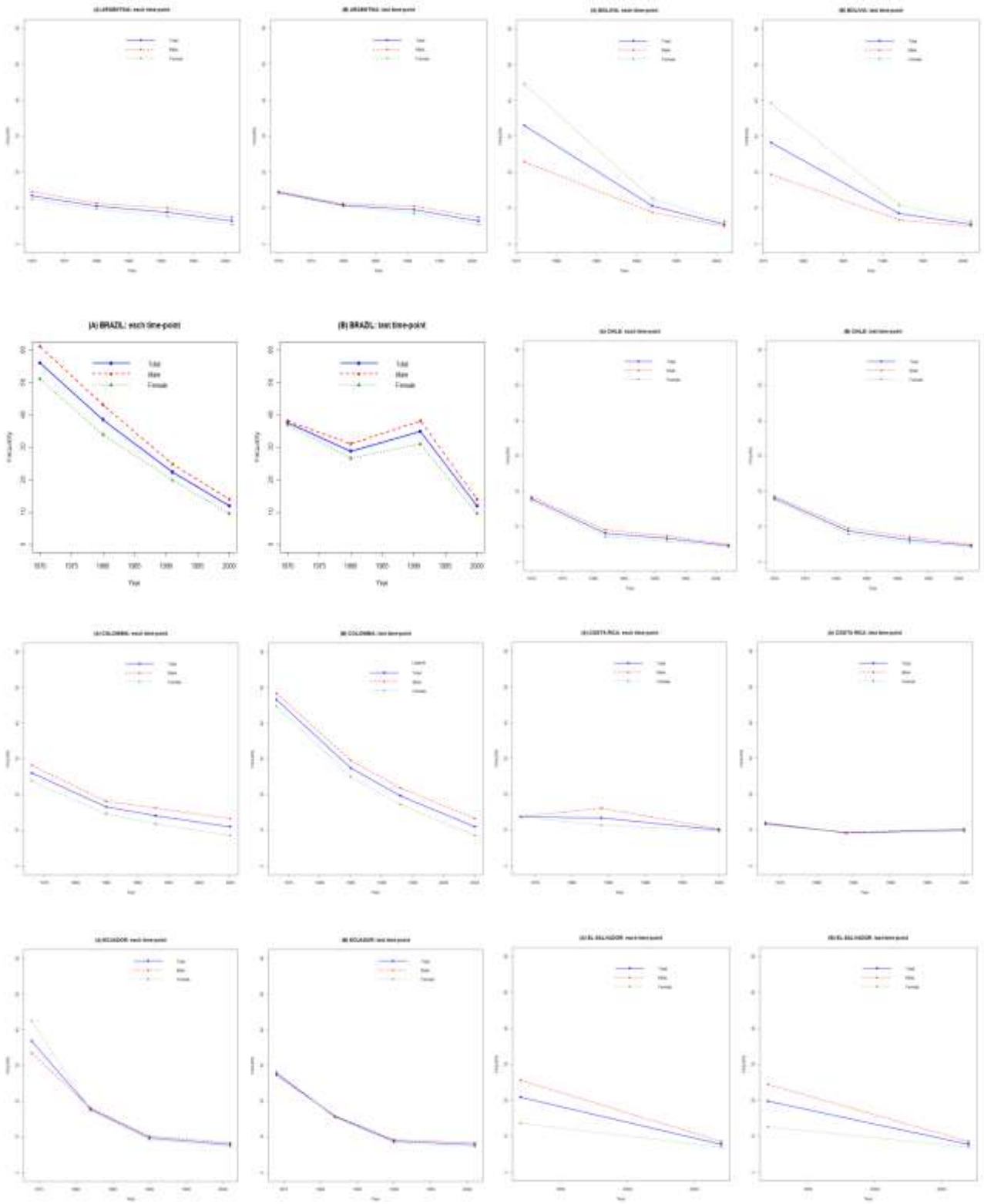
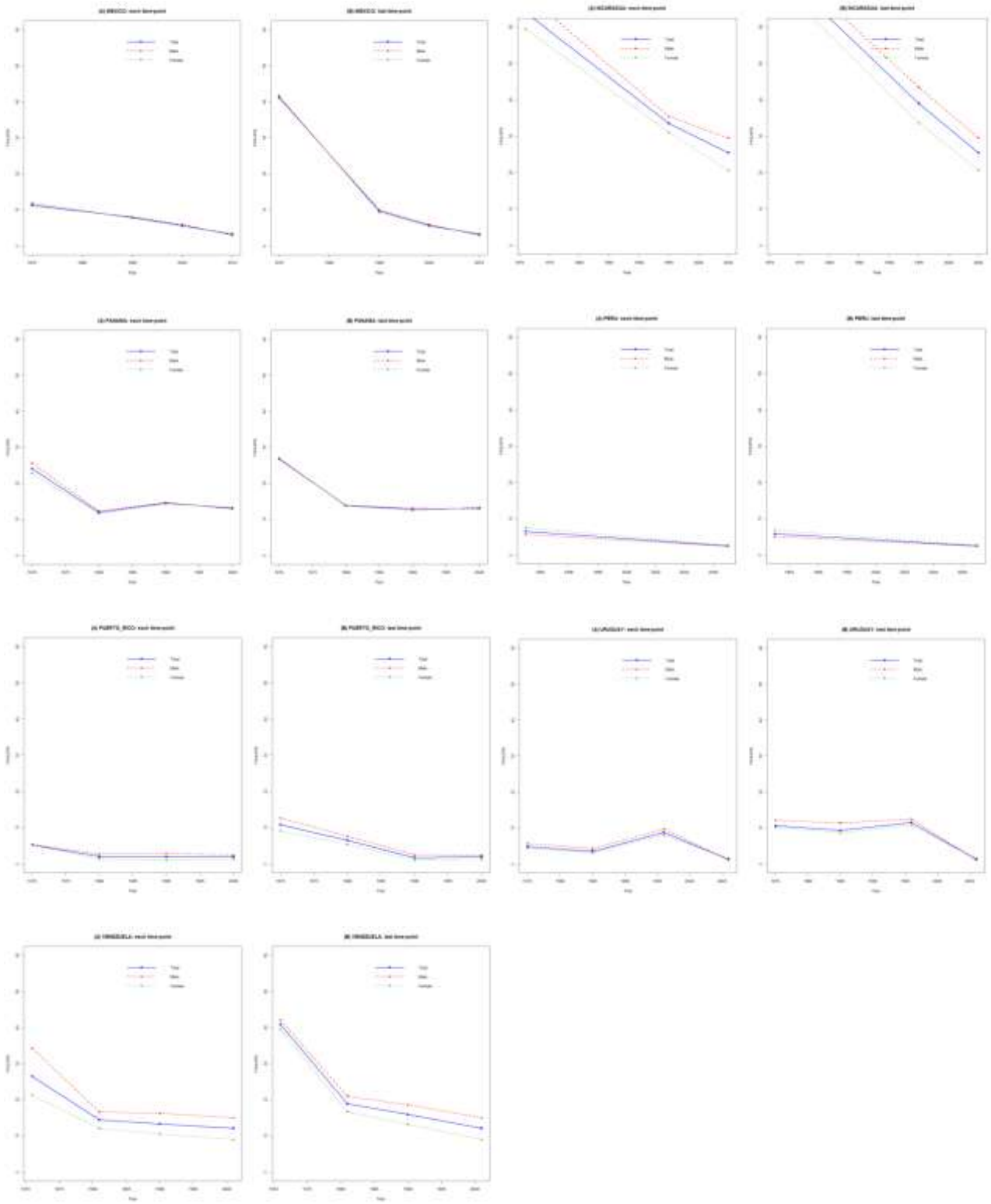


**Figure 3 (continued)**



**4. Educational inequality between Reference (mothers ≥ secondary) and Comparison 3 (mothers ≥ primary)**

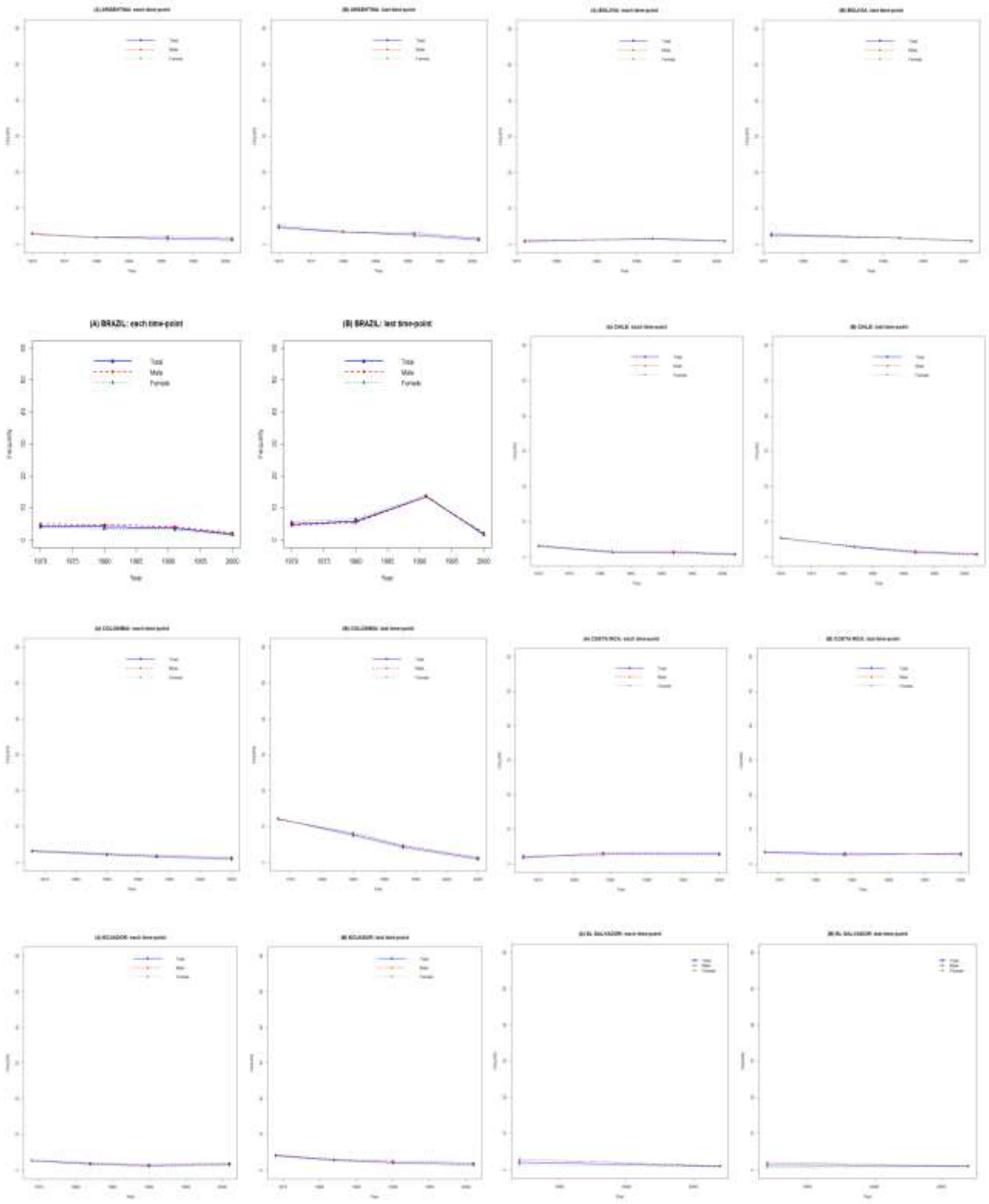


**Figure 4 (continued)**