What Do 50 Years of Census Records and Household Survey Data Tell Us about Human Opportunities and Welfare in Latin America?

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Abstract

To comprehend how development really happens, it is necessary to understand the evolution of its drivers and their relationship with individuals' income. This paper analyzes the expansion of access to education and basic services in Latin America and its association with the evolution of incomes in the region. The paper focuses on the importance of access to opportunities as one of the drivers of development and highlights the role of policy making. The findings suggest that access to education and basic public services early in life are positively correlated with incomes in adulthood. The analysis also suggests that countries follow a dissimilar path to increase access to education and basic services. The paper undertakes a comprehensive analysis of historic census records to add granularity to the assessment of the development of countries, matched with detailed individual-level information from household surveys of several countries in the region. The paper widens an ongoing area of research on the long-run relationship between access to opportunities during childhood and incomes in adulthood.

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The World Bank, Poverty and Equity Global Practice

1. Introduction

In recent years, researchers and policy makers have turned their attention to study the causes and consequences of inequality of opportunities among children, like access to basic services and education. Evidence suggests that universal access to opportunities come as part of the development process, for which sustained long-term growth and a good combination of policies are necessary (Ferreira et al. 2009). However, the relationship between inequality of opportunities and income inequality is not clear. Ferreira et al. (2009) hypothesize that a negative relation between the Human Opportunity Index and the Gini coefficient might be due to either a disconnection between opportunities and markets in the same period, or due to the relationship between inequality of opportunities in the past and inequality of income in the present. We attempt to shed light on the latter hypothesis by providing empirical evidence on the relationship between access to services at early stages in life and individual incomes in adulthood in Latin America.

We use approximately 70 million census records to analyze the evolution of access to services of different subgroups of the population in 12 countries in Latin America and the Caribbean (LAC), from the 1960s to the 2000s. Each subgroup is composed of children aged 0 to 15 years categorized by gender, residence in urban or rural areas, and the sub-region of the country. This classification, based on exogenous characteristics at the time of birth, provides enough granularity to identify differences in access to basic services and education across the young population. Each subgroup is followed throughout time to measure how fast the access to each opportunity grows and how the ranking among subgroups changes.

The second stage of the analysis studies the association between the evolution of access to basic education and public services during childhood and the level of income achieved in adulthood in several countries in the LAC region. For each subgroup described above, we compare access to each opportunity using information from censuses from the 1980s—and in some cases from the 1970s—with per capita household income of the same cohort in the most recent household survey. To the best knowledge of the authors, this is the first time that such a comprehensive data set has been organized.

There are two advantages of breaking down the population by gender, geographical areas, and urban/rural zones instead of using past subnational economic performance from national accounts. First, the population breakdown suggested in this paper provides a finer level of disaggregation than common subnational administrative records. At best, subnational GDP or aggregate consumption in the 1980s might be found at the level of aggregate geographical location but not by urban/rural zones, let alone by demographic categories like gender. Second, this breakdown considers some of the circumstances explored in the Human Opportunity Index (HOI), according to which differences in characteristics out of the control of the individual—known as circumstances—like race, gender, household composition, geographic environment, location, parental education, and wealth, among others, are associated with the unequal distribution of economic opportunities such as access to basic services and education. This analysis explores three such circumstances.

This paper makes three main contributions. This is the first paper that compiles historical data on human opportunities to analyze the relationship between access to education and basic public services early in life and incomes at adulthood. Second, this work takes a wide-ranging approach

to study the development of human opportunities by using data from 12 countries of one continent in the last 50 years. The standard approach in the literature focuses on case studies that evaluate the development path of specific countries, but such studies mainly focus on extremely successful or unsuccessful examples. This paper depicts a broader image of the LAC region, but also finds relevant stylized facts by country. Finally, this study complements long-term growth studies of aggregate data by taking into consideration information at the individual level that accounts for the disparities in coverage of public services and education among households.

This paper finds that the rise in human opportunities is universal, but increases have been heterogeneous across countries and dimensions. However, we find some common patterns in the evolution of access to opportunities between groups of countries. There are specific demographic characteristics that explain the process of increasing access to basic services. Development strategies during the last four decades are reflected in such evolution. Finally, geographic characteristics explain a significant proportion of the inequality of human opportunities.

The evidence in this paper suggests that children's universal access to basic services and education may enhance their ability to generate income during adulthood by improving human capital in society. Population groups with low access to services and education in their earlier years of life are more likely to have lower household incomes 30 years later than those that enjoyed higher access to the same opportunities.

The remainder of the paper is organized as follows. The next section presents an overview of the main sources of information and the creation of the relevant data sample. Section 3 describes the stylized facts found in the data. Finally, Section 4 concludes and proposes a research agenda.

2. Data

This paper takes advantage of publicly available census records from the IPUMS-International database and the Socioeconomic Database for Latin America and the Caribbean (SEDLAC), a harmonization project of individual-level information on incomes from national household surveys in Latin America.

2.1. The IPUMS-International database on Census records

The IPUMS-International database contains microdata based on samples of full population census records from 82 countries in the world since 1960, providing public access to anonymized samples from the official national censuses and constituting the world's largest available bank of censuses information.[1] The database is organized following similar criteria across time and countries to allow researchers to compare results from different periods and countries.

The IPUMS-International database provides information at the individual and household levels from 10 percent samples of census data—where possible—obtained by selecting every 10th household after a random start. These cross-sectional databases provide information at the individual level on demographic characteristics such as age, years of education and enrollment. This paper relies on the censuses' information on household access to basic public services and

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[1] For an overview on the IPUMS-International project, see https://international.ipums.org/international/overview.shtml.
For an example of a historical census record, see Appendix A.1.

education to estimate access to human opportunities. Regarding the former, access to clean water, access to electricity and access to sewerage systems are consistent across time and countries. Regarding the latter, this analysis focuses on school enrollment and primary education completion.

2.2. Harmonized database on individual-level incomes

This paper relies on the SEDLAC database as a primary source of comparable welfare aggregates among Latin American countries. SEDLAC is a database of harmonized household surveys of LAC countries compiled by the poverty group at the World Bank in partnership with the Center for Distributive, Labor, and Social Studies (CEDLAS, for its acronym in Spanish) at the Universidad Nacional de La Plata in Argentina. This database provides the most comparable socioeconomic measures across LAC countries, including almost 400 household surveys of 18 countries from the 1970s to the present.

The SEDLAC project implements a few adjustments to the original microdata to enhance comparability across countries and over time. First, incoherent information is handled to avoid biases. An observation is considered incoherent when individuals first identify themselves as currently (at the moment of the interview) working in a paid job, but in subsequent questions regarding earnings from their main occupations they fail to declare any income or declare zero income. After identifying the household head, the project excludes those households where i) the labor income of the household's head is individually incoherent; ii) households with a single employed member whose income is incoherent (whether he/she is the head of the household or not); and iii) households where the head is not employed and the income of the employed member with the highest educational attainment (as a proxy for income level) is individually incoherent.

While some individuals do not declare income in secondary or other paid occupations, these observations are not excluded but instead, this income source is treated as zero income (Bourguignon 2015).

Second, SEDLAC considers the utility return of the dwelling by imputing household rents as follows. If the National Statistics Office (NSO hereafter) provides a vector of imputed rent, the SEDLAC project adopts that vector as part of the harmonization. If such vector is not provided, the project uses the self-reported value by dwelling owners to the question, "If you had to rent this dwelling, how much would have you to pay for it?"[2] Once again, if this value is available, it is taken as given and used to impute rents. In case this question is not included in the survey, the project implements a hedonic model that considers the actual rent paid by tenants and impute a corresponding value to owners. Finally, in the absence of price data, the SEDLAC project scales up rural household income 15% to account for urban/rural differences.[3]

2.3. Matching Census data with household surveys

The same age cohort of the population is analyzed to make the subgroups of population comparable between the census and the household surveys. For instance, if the range of time between the census and the survey is 30 years, and the age cohort in the census is from 0 to 15 years old, the age cohort analyzed in the household survey would be 30 to 45 years old. With respect to sub-

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[2] Or any of its variations.

[3] This procedure is implemented for all countries except for Peru, since the NSO provides household incomes already deflated to the city of Lima.

national regions, both the census and surveys generally have information from the same geographical locations. When this is not the case, it is necessary to aggregate locations to match the minimum common factor. For example, given that the Colombian census of 1985 aggregates the information of three departments (Caldas, Quindio, and Risaralda) but the same departments appear separately in the household survey, it was necessary to group them in the survey to match the census disaggregation. In Mexico, the subnational breakdown of the household surveys comprises only eight regions, whereas the census has information for 32 states. In these cases, the census data had to be aggregated to match the household survey.[4]

This paper aims to shed light on the relationship between access to opportunities during childhood and household income in adulthood at the subnational level for different demographic groups, relying on both census records and data from household surveys, although household surveys are typically not statistically representative at these levels of disaggregation. Thus, in spite that our results are consistent across countries and opportunities, they should be interpreted considering these limitations.

3. Stylized facts

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[4] The Mexican household survey ENIGH-MCS includes a module that is representative at the same level of disaggregation as the census. However, the survey used in the SEDLAC project is the standard ENIGH, which does not have such statistical power. The reason for including the ENIGH rather than the ENIGH-MCS was that, by being the former part of the SEDLAC project, we are guaranteed a better level of comparability between countries.

This section of the paper discusses some of the stylized facts found after analyzing the census information for 12 countries in Latin America, as well as their correspondent harmonized household surveys.

## 3.1. The evolution of growth and poverty in Latin America

Economic growth in the region was an important driver for reducing poverty and improving the lives of many poor people during the last 50 years. The trend of the gross domestic product (GDP) in the LAC region was positive during half a century, although growth in the LAC region lagged other economies in the globe, such as the Four Asian Tigers.[5] At the same time, during the last 20 years the increase in GDP has been accompanied by a decline in poverty rates at the regional level (Figure 1), although recent weakening of economic conditions during 2015 and 2016 were accompanied by a relative slowdown of the social gains in the region (World Bank, 2016a).

Over the last decade, poverty reduction in LAC was driven mainly by economic growth, such that weak economic conditions in 2015 and 2016 raised concern on the challenge faced by further reductions in poverty and the growth of the middle class (World Bank, 2016a). Along with the reduction in poverty rates, improvement in other welfare indicators associated with development outcomes suggests that inequality has also been falling (the Gini index declined from 0.57 to 0.51

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[5] The Four Asian Tigers are Hong Kong SAR, China; Singapore; the Republic of Korea; and Taiwan, Chian, which experienced and maintained high growth rates between the early 1960s and the 1990s.

during the 1999-2015 period), such that LAC is a more equal region today than it was 20 years ago (World Bank, 2011).[6]

Figure 1 GDP and Poverty rate (1960s-2010s)
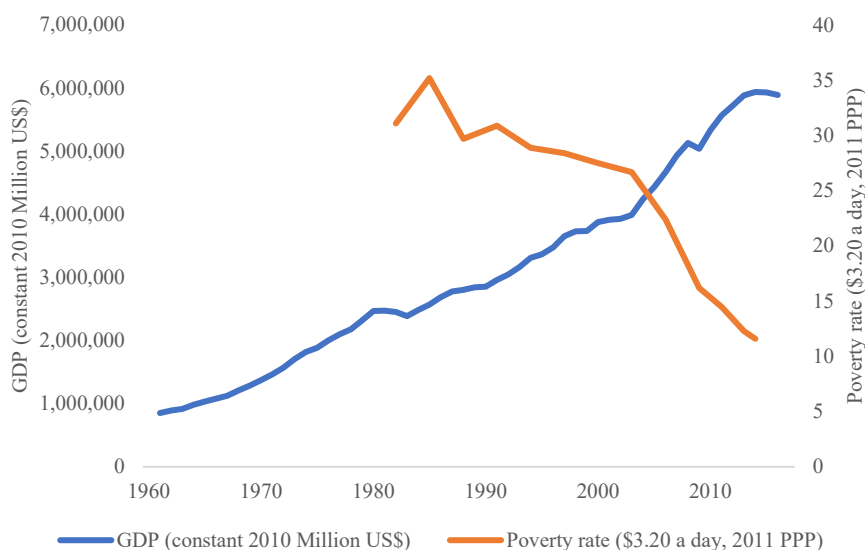
Despite the general reduction in absolute poverty and income inequality, the overall welfare of the population has not improved equally in other areas, such as access to basic education and public services. In this paper we are interested in understanding, first, if people in LAC are receiving equal opportunities early in life—whatever their socioeconomic background—and, second, if such opportunities are contributing to improved welfare outcomes later in life. The

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[6] According to the World Bank (2011), the decrease in inequality has been driven by improvements in labor market outcomes, such as labor income, a higher incidence of government transfers and demographic changes.

Human Opportunity Index (HOI) developed by the World Bank suggests that, although in LAC access to education and basic public services remains far from universal, the region made important progress in providing access to basic education, sanitation, and connectivity during the last 15 years (World Bank, 2016a). Nevertheless, household characteristics (family composition and characteristics of the household head) and income per capita at the household level continue to be strong determinants of access to such opportunities. In addition, heterogeneity across countries continues to be a pressing issue, since countries in Central America show low levels of HOI along with unequal opportunities for children (World Bank, 2016b).

The channels by which economic growth has benefited the poor are not immediately obvious and with this paper we aim to contribute to understanding if and how the expansion in coverage and the subsequent increase in access to opportunities could have affected welfare among Latin Americans.

3.2. The evolution of access to services in Latin America

During the last five decades, access to basic public services and education has been increasing continuously in LAC. With few exceptions—such as Bolivia— countries in the region have seen a massive increase of human opportunities since the 1960s. Even in periods of low economic growth, like the 1980s and 1990s, when average growth rates of GDP per capita were 0.1 percent and 0.7 percent, respectively, access to basic services continued to increase. However, improvement in the region has lagged the achievement of other countries. For example, when we compare educational attainment in LAC against countries from other regions, like Thailand or

Indonesia (see Figure 2), we see that countries with coverage similar to LAC in the 1960s, ended with higher access rates.

Figure 2. Spread of educational attainment over the last 50 years
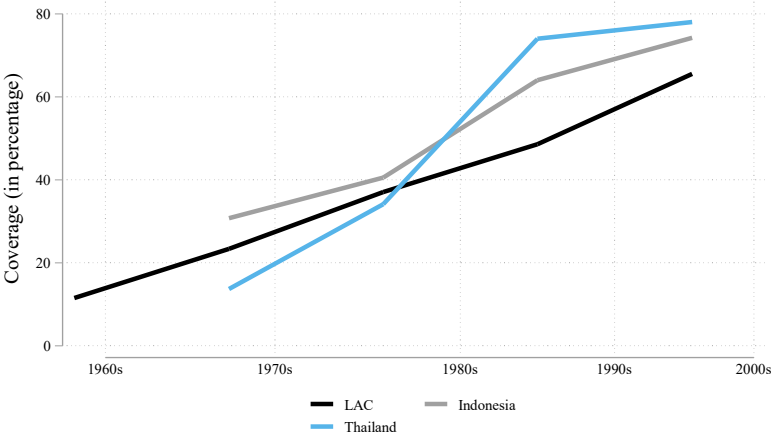
Although alternative hypotheses could explain the continuous expansion of coverage, such as the irreversibility of the fixed investments required to provide coverage of basic public services, or an unobserved decline in the quality of these, the data available in this paper do not allow us to test for these competing explanations. However, the stylized facts show that, on average, coverage increases steadily in the region.

Figure 3 shows that, although there is an overall positive trend in access to basic public services and education, the opportunities that presented greater and continuous growth were access to electricity, school attendance and access to clean water. In the 1960s, most of the countries in LAC had electricity access rates below 40 percent. Fifty years later, access to electricity is above 85 percent for almost every country in the region. Similarly, school attendance evolved positively

with the access rate from the 1960s to the 2000s. Access to water also improved significantly during the period of analysis. While one in four households had access to clean water during the 1960s, by the 2000s three out of four households were covered.

Figure 3. Evolution of the access to services in LAC over 50 years
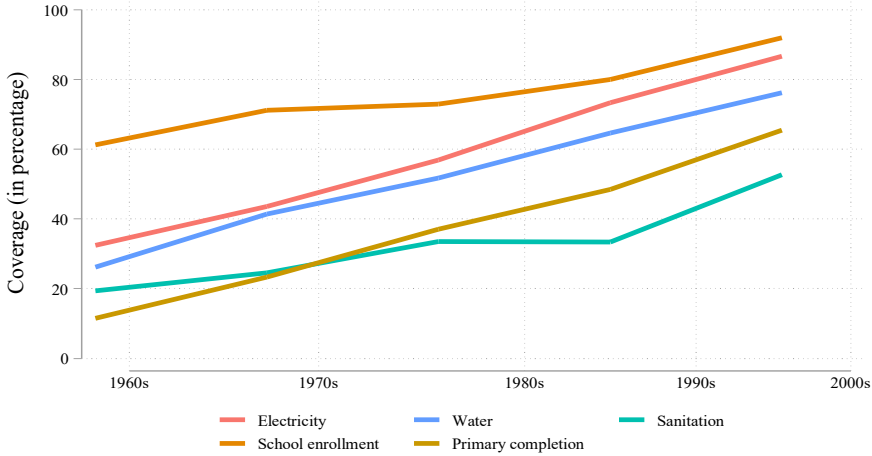
Although the increase in primary completion and access to sanitation has also been significant, it has not improved as much as electricity, school enrollment or access to water. The increase in the coverage of sanitation has faced some challenges during the 1960-2000 period. Sewerage systems, which commonly need major specific fixed investments, especially for the layout of a public network, are the only dimension that stagnated jointly with GDP growth in the 1980s and 1990s. Even for large countries like Brazil, access to sewerage is still below 50 percent in many districts. Figure 4 shows the development of access to sewerage of the different subgroups in each country over time.

Now, to what extent do we observe persistence in access to opportunities in the LAC region? To estimate persistence, we measure the correlation in the rankings among subgroups within countries during the period of analysis, using the Spearman's rank-order correlation.[7] In particular, we measure both the ranking correlation among consecutive censuses and the correlation with respect to the ranking in a year (or census) of reference. In the former case, given the irreversibility of fixed investments required to expand coverage of basic public services, we would expect that access to electricity, water and sewerage showed higher persistence in time. In the latter case, we expect the persistence to dissipate as we move farther away from the reference year.

In practice, we observe that the ranking correlation in consecutive censuses is relatively high (above 0.90 on average) for electricity, water and sewerage, both in countries with high and low geographic heterogeneity (e.g., Peru and Uruguay, respectively) and for different coverage rates (e.g. high coverage countries such as Costa Rica and low coverage like Bolivia). However, once countries are closer to achieving universal coverage of a basic service (such as electricity in Uruguay after the mid-1990s), the ranking becomes more sensitive to changes in time. A potential explanation is that, once a country approaches universal coverage, access rates for all subgroups

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[7] The Spearman correlation calculates the Pearson correlation for variables that are converted to ranks. Broadly speaking, a positive correlation coefficient indicates a positive relationship between the two variables, while a negative correlation coefficients expresses a negative relationship; a correlation coefficient of 0 indicates that no relationship between the variables exists at all.

are closer (i.e., near 100 percent), so small changes in coverage rates could have large impacts in the relative ranking of a specific group.

Figure 4. Access to sewerage systems over time by subgroups
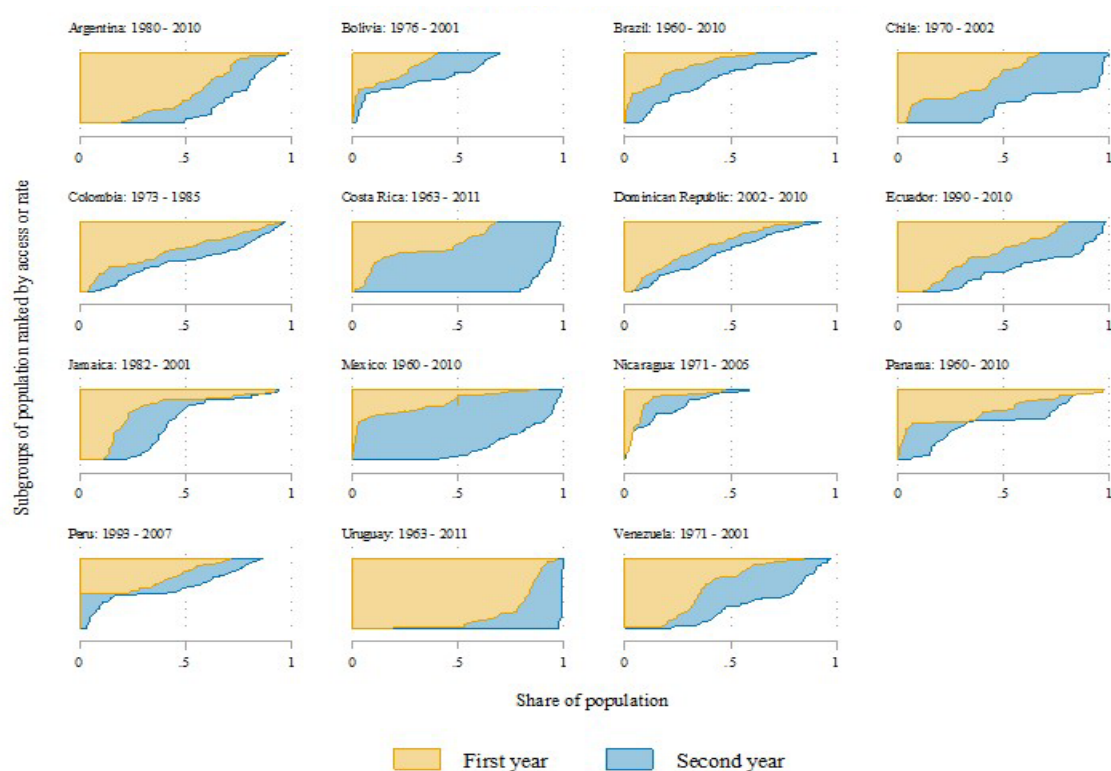
3.3. The heterogeneous evolution of access to services

Even though the share of the population enjoying the opportunities under analysis has increased during the past 50 years, the growth of access to each opportunity has not been evenly distributed across subgroups. In general, the evolution of access to basic services in LAC suggests that the

division between urban and rural zones is the main determinant of inequality across all opportunities (electricity, water, sewerage and primary completion), except school enrollment.

Figure 5. Relationship between access to opportunities
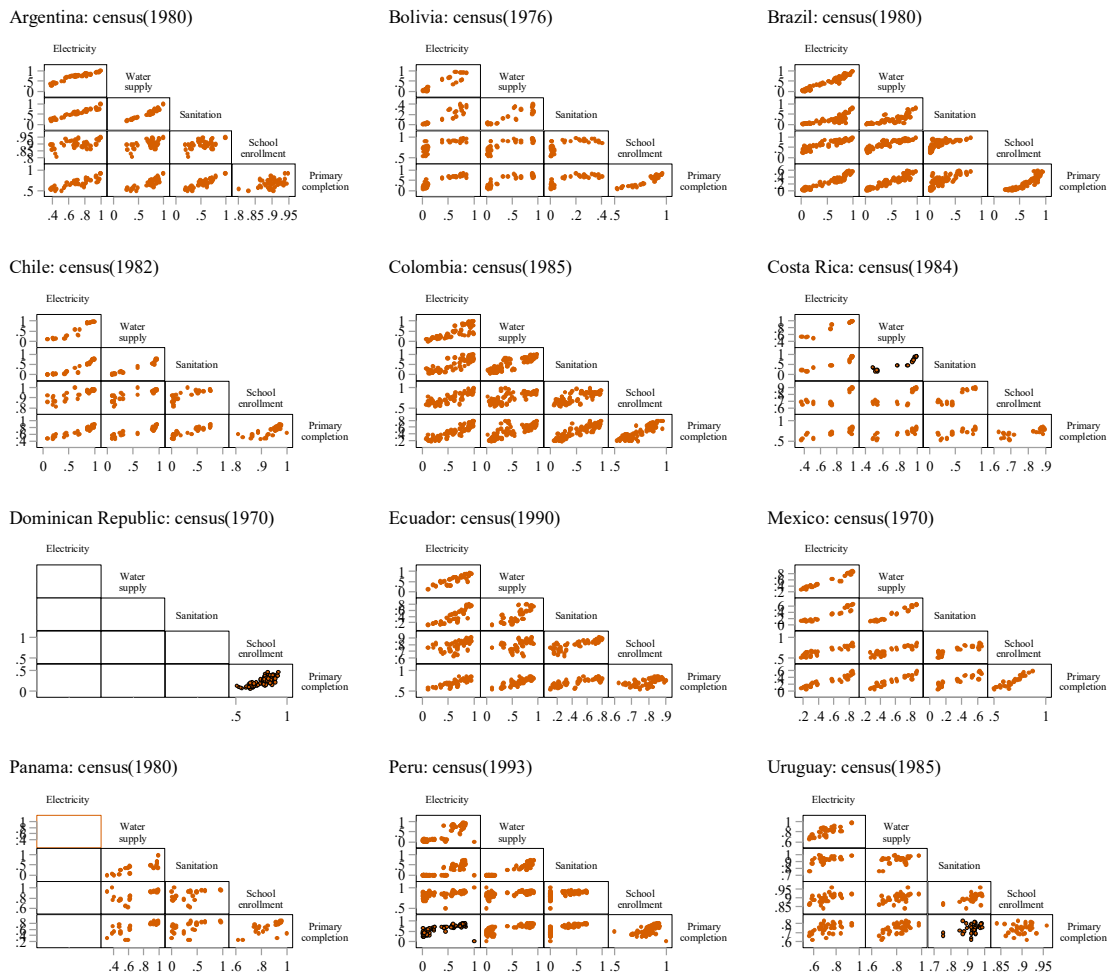
Source: Own elaboration based on IPUMS data.

A common pattern observed in the evolution of access to electricity is the increase of coverage during the first two decades, though unequal among subgroups, followed by a slower-paced, less unequal increase in coverage during the more recent 20-year period (one potential explanation being that once coverage in urban and more accessible areas approaches universal access, expanding coverage to reach rural or remote areas becomes increasingly costly). While in the 1960s and 1970s access to electricity was close to universal only in the urban areas of the largest cities (suggesting inequality of access within countries in the region), by the late 1990s coverage was approaching universality in the urban areas of most countries in Latin America and reaching important levels of coverage even in rural areas. Let's take two countries to help illustrate this situation. For example, Bolivia—a country in the Andean region with an important level of geographical heterogeneity—shows a high coverage level in urban areas of the largest cities since the 1970s, but a continuous catching-up of the rest of the country during the next decades. Similarly, in Brazil early access to electricity only happens for the richest provinces during the 1960s and 1970s, then inequality gradually falls as coverage increases in urban and rural areas in the smaller provinces.

For primary completion, the evolution of graduation rates suggests the existence of a divide between urban and rural areas. Although for most countries the gap in access between urban and rural areas has recently narrowed, countries with a large share of rural areas, such as Bolivia or Peru, still show a lag in primary completion in rural areas with respect to the rest of the country and the region.

In contrast, for other basic public services such as access to water, the urban/rural divide does not fully explain the evolution of access in all countries in the LAC region. In countries such as

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Panama, the most prosperous regions seem to improve first, and then inequality starts falling as the rest of the country catches up. On the other hand, in countries like Peru, which has significant rural areas, the growth of access to water is initially parallel in urban and rural areas across the country. In contrast to access to water, the urban/rural split on the provision of sewerage is wide and remains so across the region. Notice that we must make a precision about the way we are measuring "access" to water and sewerage, since in this paper we rely on broad definitions. For instance, water coverage implies access to any type of piped water (e.g., inside the household, outside of the household and shared or through a public network), while sewerage coverage spans from access to a septic tank to a connection to the public network.

Overall, the evolution of sewerage coverage does not seem to follow a clear path. While countries with large urban areas such as Costa Rica and Uruguay showed important increases in coverage (mainly from the 1960s), improvements in access to sewerage seems to be slower in countries like Argentina, Ecuador, Jamaica, and Panama. Moreover, even today there is a significant access gap in several countries in the region like Bolivia, Brazil, Chile, Dominican Republic, Ecuador, Mexico, Nicaragua (only 2005) and Peru.

3.4. The relationship between access to services and income in Latin America

In this section, we compare access to opportunities in early childhood for each subgroup to the corresponding income level in adulthood several decades later, assuming that adults make their

living in the same place of their upbringing.[8] For each subgroup d of children (0-15 years old)—classified according to their gender, urban/rural zone, and subnational region of residence—we calculate the share of the population with access to each opportunity in the 1980s using census data and compare it to the corresponding level of household income in the most recent household survey. The following quadratic form summarizes the estimation:

$$Y_d = \alpha + KS_{d,j} + PS^2_{d,j} \tag{1}$$

In this case, $S_{d,j}$ is the share of the population in subgroup d with access to opportunity j in to the oldest census available for each country. For most countries in Latin America, the oldest census available is from the decade of the 1980s. Y_d, in contrast, is the mean income of subgroup d in the most recent household survey available. Finally, K and P are the estimators of the regression.

Given that household surveys are not designed to provide estimates for such levels of demographic and geographical disaggregation, it is necessary to borrow strength from large auxiliary data—like censuses—and take advantage of their level of precision. This information is then combined with data from the household surveys to implement an econometric model that yields reliable small area estimates (Rao and Molina, 2015). The small area estimation

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[8] The assumption of no migration is in fact conservative for the purpose of this paper. In most of the cases, people moved to a better place than the current one. If that is the case, people who were born in places with low access to opportunities would move, in general, to places with better access to such services, so that their final current level of income is similar to the level of income of those who were born in the better-off places.

implemented here follows closely the methodology suggested by Fay and Herriot (1979), in which a linear mixed model establishes the relationship between the welfare parameter and auxiliary subgroup level information.

$$Y_d = \mathbb{X}'_d \beta + u_d, \qquad d = 1, \dots, D, \tag{2}$$

where Y_d is the mean income, $\mathbb{X}_d$ is a vector of characteristics, and u_d is a vector of random effects with mean zero and variance σ_u^2 that account for additional variability that is not explained by $\mathbb{X}_d$ in subgroup d. These characteristics are found in the most recent census (or the one closest to the most recent available household survey) and are country-specific. However, most countries provide information of characteristics at the household and individual level such as geography, access to utilities, ownership of appliances (and/or amenities), dwelling features, demography, fertility, mortality, education, and disabilities.

Given that the household income parameter, Y_d, is not available in the census, it must be estimated from the household survey by,

$$\hat{Y}_d = Y_d + e_d \tag{3}$$

where e_d is the sampling error associated with the estimation of $\hat{Y}_d$, such that the direct estimator is assumed to be unbiased, $E(e_d|Y_d) = 0$, and the variances ϕ_d, are assumed to be known, $V(e_d|Y_d) = \phi_d$. Thus, by combining equations (2) and (3) we obtain the following mixed linear model,

$$\hat{Y}_d = \mathbb{X}'_d \beta + u_d + e_d \tag{4}$$

To obtain the *empirical best linear unbiased predictor* (EBLUP) of $\hat{Y}_d$, which is unbiased and minimizes the mean squared error (MSE) of the model, Fay and Herriot (1979, 270) suggest

estimating Bayesian convex linear combination of the direct estimator of the survey, $\hat{Y}_d$, and the synthetic estimator of the regression based on census data, $\mathbb{X}'_d\tilde{\beta}$,

$$\tilde{Y}_d^{FH} = \gamma_d \cdot \hat{Y}_d + (1 - \gamma) \cdot \mathbb{X}'_d\tilde{\beta} \tag{5}$$

where $\gamma_d = \hat{\sigma}_u^2 / (\hat{\sigma}_u^2 + \phi_d)$ and $\tilde{\beta}$ is the estimator of weighted least squares of β in equation (3). The weight γ_d depends on the sample size of the D subgroups through variance ϕ_d of $\hat{Y}_d$ and goodness of fit of the synthetic model through variance $\hat{\sigma}_d^2$.[9] Thus, for those subgroups with large sample size in which ϕ_d is small, the Fay-Herriot estimator, $\tilde{Y}_d^{FH}$, assigns more weight to the direct estimator from the survey, $\hat{Y}_d$. Conversely, if ϕ_d is large, $\tilde{Y}_d^{FH}$ assigns more weight to synthetic estimator, $\mathbb{X}'_d\tilde{\beta}$, which makes use of data from all subgroups to estimate β.

Once the $\tilde{Y}_d^{FH}$ is calculated, it is compared to the share of the population in subgroup d with access to each opportunity several decades before. That is, we include the estimates of equation (5) into equation (1).

$$\tilde{Y}_d^{FH} = \alpha + KS_{d,j} + PS_{d,j}^2 \tag{6}$$

In other words, we plot the proportion of children in subgroup d in the 1980s against its corresponding income level 30 years later. In general, we find a consistent positive relation

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[9] Given than the true value of σ_d^2 is unknown, we correct the estimator of the variance through the residual/restricted maximum likelihood method (REML), which provides a less biased estimator for finite sample sizes.

between the access to opportunities in early childhood to the corresponding income level at adulthood.

Figure 6. Primary completion and Median income
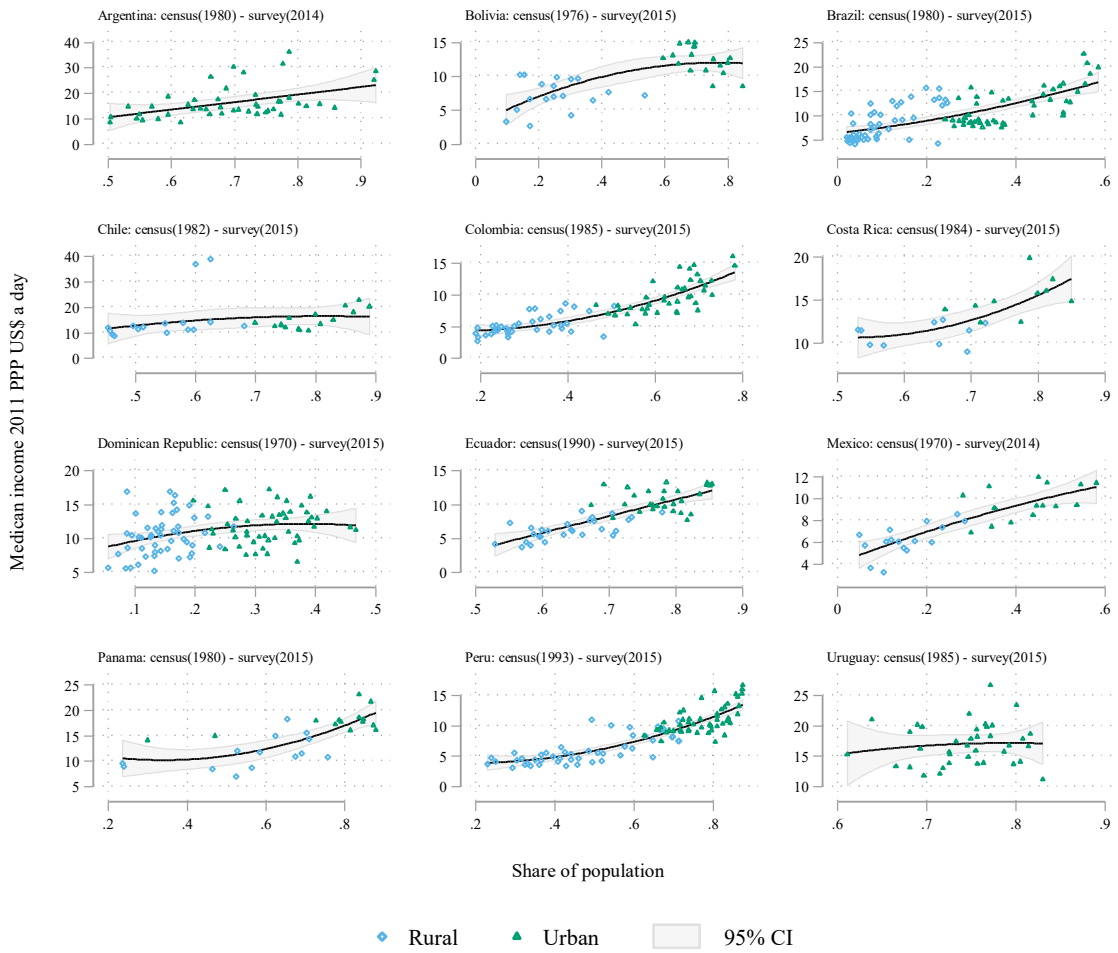
**Source:** Own elaboration based on IPUMS data and national household survey.

For instance, one such group could be composed of the share of *girls* aged 0 to 15 years old with *access to water supply* who lived in *rural* areas in *Antioquia*, Colombia, based on the census of 1985. Then, we calculate the household income of the same subgroup 30 years later—women from 30 to 45 years old—based on the household survey of 2015. We perform the same procedure for all the possible combinations of subgroups in 12 countries in LAC. The results reflect a strong correlation between past access to services and education and current household income levels.

Figure 6 shows the relationship between primary completion in the 1980s and household income in 2015 (circa). For some countries like Bolivia, Brazil, Colombia, Ecuador, Mexico, and Peru, the relationship is remarkable. Subgroups with lower primary completion rates in the 1980s have consistently lower household income in 2015 than those with higher primary completion rates. In addition, this relationship is stronger in the tails of the distribution of primary completion rates. Bolivia, for instance, shows clear differences in this opportunity between rural and urban areas. Primary completion in urban areas are on average twice as large as the former rural ones and, consequently, their median household income is also higher. In other cases, like Brazil or Mexico, the distinction is clear in the tails but not at the center of the distribution. In both countries, the distribution of the share of primary completion starts close to zero and goes up to 60 percent. For those subgroups at the very bottom and at the very top of the distribution their corresponding household incomes several decades later are associated with the starting point of primary completion. However, the variability of household income levels of the subgroups at the center of the primary completion distribution is wider and not clear relationship is found.

For other countries, like Dominican Republic, Chile, and Uruguay, the relationship between primary completion and household income 30 years later is not clear. For these countries, the initial

level of primary completion in the subgroups does not seem to determine the level of household income decades later at the subgroup level.

Figure 7. Water supply and Median income
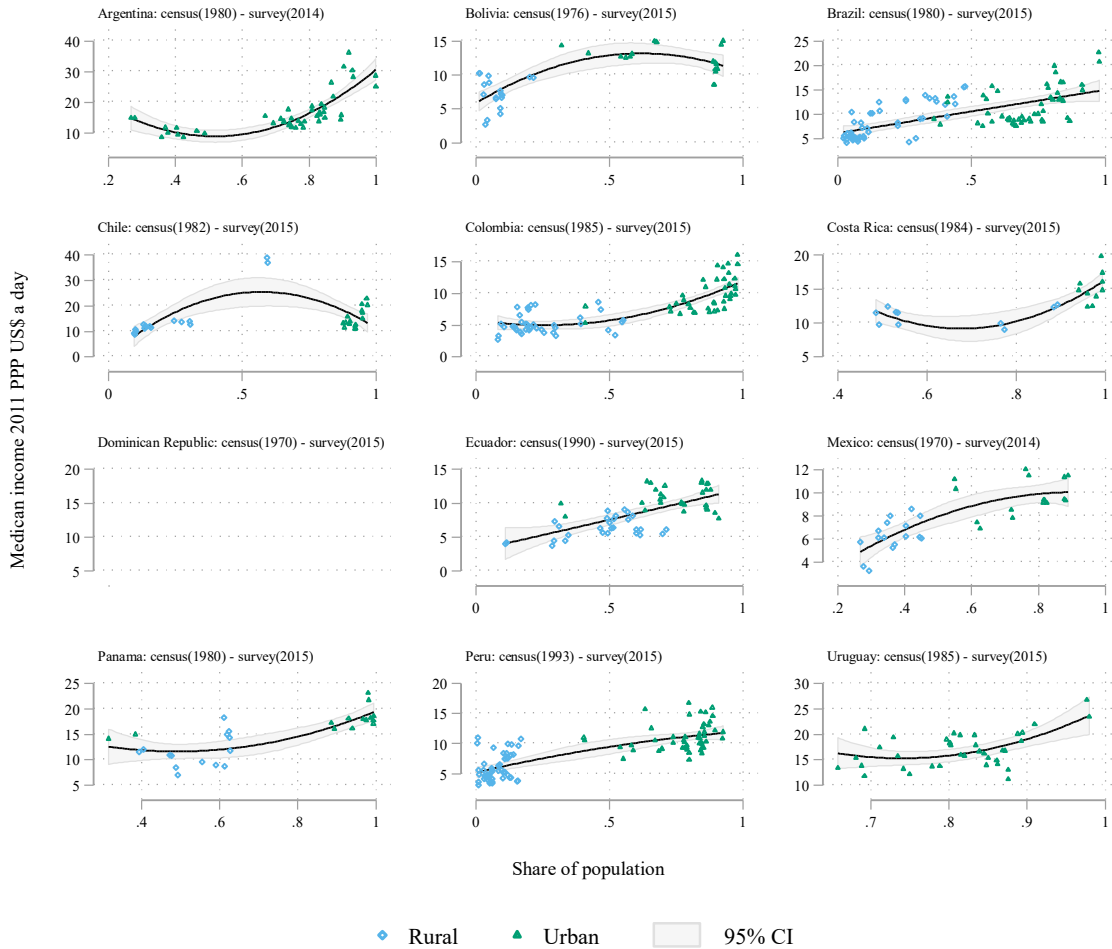
The relationship between access to water supply in the 1980s and household income level in 2015 is slightly different than the case of primary completion (Figure 7). First, for most of the countries, there is a difference in access to water supply between rural and urban areas. Though it would be expected to find that 30 years ago rural areas had less access to water supply than urban

areas, the magnitudes of the coverage gaps show a confounded differentiation in access to opportunities. Countries like Peru, Colombia, Bolivia, Chile, and Panama are clear examples of such gaps.

Individuals' income, however, does not present the same gaps as access to water supply. Some of the subgroups that started with low access to water supply in rural areas in the 1980s ended up having similar household incomes in 2015 as subgroups with higher levels of access to water in urban areas. Nevertheless, the relationship in the tails of the distribution prevails, as in the case of primary completion. On average, subgroups in the bottom of the distribution of access to water belong to the poorer households in 2015. Though the household survey of Argentina does not provide information for rural zones, there is a clear gap in the access to water. The subnational regions with lower access to water supply are in fact the most marginalized subregions in the country and, consequently, the poorest.

4. Research agenda

After analyzing the relationship between access to basic education and public services early in life and income level in adulthood during the last 50 years in Latin America, we were able to identify some common elements. First, at the regional level, we observe an important improvement in human opportunities during the 50 years of analysis. There are specific demographic and geographic characteristics that explain the process of increasing access to basic services, as well as elements associated with the technology underlying the provision of the different services under analysis.

Latin America has experienced a general increase in access to services that has been shared not only among countries across the region, but also within countries in urban and rural localities, as well as across genders. The evidence in this paper shows that universal access to basic services and education for children are positively correlated and suggest that improved access to opportunities may foster individuals' income generation capabilities in adulthood. The intuition behind this result is that access to basic services and education help children develop the human capital they need to engage in productive economic activities and achieve higher levels of incomes in adulthood, steppingstones to mobility on the economic and social ladder within and across generations.

In addition to the stylized facts of the development of human opportunities in LAC found in the data, this paper raises some questions that signal future avenues of analysis. For instance, is temporal inequality of opportunities an inevitable step to assure universal coverage later? In addition, how does the starting point affect subsequent evolution of opportunities if we observe a U-shape performance of inequality of access to services? Finally, is access to all opportunities during childhood equally important to guarantee the accumulation of human capital necessary for higher levels of income in the future?

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Appendix

A.1.   Census record

A.2.   Availability of Census data by country and decade

Number of censuses available

Country	1960-69	1970-79	1980-89	1990-99	2000-10
Argentina	0	1	1	1	2
Bolivia	0	1	0	1	1
Brazil	1	1	1	1	2
Chile	1	1	1	1	1
Colombia	1	1	1	1	1
Costa Rica	1	1	1	0	1
Dominican Republic	1	1	1	0	2
Ecuador	1	1	1	1	2
Haiti	0	1	1	0	1
Jamaica	0	0	1	1	1
Mexico	1	1	0	2	3
Nicaragua	0	1	0	1	1
Panama	1	1	1	1	2
Paraguay	1	1	1	1	1
Peru	0	0	0	1	1
Santa Lucia	0	0	1	1	0
Uruguay	1	1	1	1	1
Venezuela, RB	0	1	1	1	1

Source: World Bank using census records from IPUMS-International.