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Marina Bassi
Matías Busso
Juan Sebastián Muñoz

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Inter-American Development Bank
Department of Research and Chief Economist

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Abstract[1]

This paper uses 113 household surveys from 18 Latin American countries to document patterns in secondary school graduation rates over the period 1990–2010. It is found that enrollment and graduation rates increased dramatically during that period, while dropout rates decreased. Two explanations for these patterns are provided. First, countries implemented changes on the supply side to increase access, by increasing the resources allocated to education and designing policies to help students staying in school. At the same time, economic incentives to stay in school changed, since returns to secondary education increased over the 1990s. Despite this progress, graduation rates are low, and there persist remarkable gaps in educational outcomes in terms of gender, income quintiles, and regions within countries. In addition, wage returns have recently stagnated, and the quality of education in the region is low, casting doubts on whether the positive trend is sustainable in the medium term.

JEL classifications: I21, I24, O54
Keywords: Secondary school, Graduation, Enrollment, Dropout, Latin America

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[1] Corresponding authors: Marina Bassi (marinab@iadb.org) and Matias Busso (mbusso@iadb.org). We thank Richard Murnane, Juliana Chen Peraza, and Hugo Ñopo for their helpful comments. The usual disclaimer applies. The views expressed herein are those of the authors and should not be attributed to the Inter-American Development Bank. Please do not reprint without authors' written approval.

1. Introduction

The average years of education of the population across the world have increased dramatically in the last 60 years, and Latin America has been no exception.[2] A larger share of Latin American children and youth, especially from vulnerable families that were otherwise excluded from the education system, are now able to attend secondary school. The consequent increase in student heterogeneity has heightened the challenges of retaining children in school until graduation as well as providing a good quality of education. Despite the magnitude of the changes, few attempts have been made to compute and explain the patterns of enrollment, graduation, and dropout rates in Latin America over the last two decades. This paper is devised to do just that.

High school graduation has been a major concern in developed countries such as the United States. After showing extraordinary growth, from 6 percent in the beginning of the twentieth century to around 80 percent in the early 1970s, high school graduation rates stagnated or even slightly declined over the following three decades (Heckman and Lafontaine, 2010; Murnane, 2013). This stagnation led many to refer to the problem as the dropout crisis or epidemic. Concerns with completion of secondary education in the United States generated a great deal of attention from researchers and government institutions, which led to an intense debate and a large volume of literature on the measurement and definition of graduation and dropout rates. This literature presents a very wide range of estimates. As stated in Heckman and Lafontaine (2010, p. 244), "Depending on the data sources, definitions, and methods used, the U.S. graduation rate is claimed to be anywhere from 66 percent to 88 percent in recent years—a wide range for such a basic educational statistic."

Following Heckman and Lafontaine (2010) and Murnane (2013), this paper examines patterns of educational outcomes (in terms of graduation, dropout, enrollment, and overage rates) over the period 1990-2010 in 18 Latin American countries for which comparable data from household surveys are available. In view of the significant changes in education systems, it is relevant for educational policies to have a clear picture of the patterns of educational outcomes,

[2] These drastic gains were part of a trend that similarly affected most regions of the world. In advanced economies, the ratio of secondary school graduates to the population aged 15 years or more increased from 12.7 percent in 1950 to 37.7 percent in 2010, while in East Asia, it improved from 4.2 percent to 38.1 percent in the same period (Barro and Lee, 2013).

plausible explanations for these patterns, and the potential challenges that educational policy might face in the near future. This is one of the contributions this paper attempts to make.

The debate in the U.S. literature about measurement methodologies of high school graduation rates and their policy implications helped identify the focus of this paper, namely, the manner in which these measures are defined and constructed. We pay special attention to building statistics that are comparable over time and across countries. Even though we document levels and trends for several educational outcomes by country, we try not to emphasize individual countries' dynamics. The ultimate goal is to find common trends. This paper focuses mainly on secondary education, although it also analyzes educational outcomes in primary education as a precondition for enrollment in secondary education. We also explore heterogeneity in terms of countries, gender, income, and region.

We show that graduation rates in Latin America have improved remarkably since the early 1990s. The percentage of students graduating from primary and secondary school on time increased in all the countries included in our sample (except for Uruguay, where it remained almost unchanged). In addition, the timing of the highest school dropout in the education cycle shifted from primary education to early secondary education, implying that students stay in school longer.

Our results also suggest that the increase in secondary school graduation can be associated with three factors: an increase in public spending on education, which was explicitly aimed at increasing attendance; increases in enrollment and graduation rates of primary schools and the efficacy of secondary schools to capture and retain those graduates; and finally, an increase in expected returns to education, which provided economic incentives to stay in secondary school. The improvement in secondary school graduation rates is akin to a glass half full.

Despite this overall improvement, big challenges remain in terms of secondary school performance. Graduation rates in the region are low relative to developed countries; a large fraction of young students drops out from school before completing secondary school; there are still important differences in achievement levels among students in urban and rural areas, among families with high and low levels of income, and among countries; and, finally, the education quality is well below other countries with a similar GDP. These challenges are akin to a half-empty glass.

This paper is organized as follows. Section 2 describes the data. Section 3 discusses how we measure educational outcomes. Section 4 presents patterns in Latin America's secondary school indicators. Section 5 presents the main explanations for the increase in the secondary education graduation rate. Section 6 discusses the region's education challenges. Section 7 concludes.

2. Data

Our analysis is based on 113 household surveys carried out in 18 Latin American countries during the period 1990–2010.[3] We take long differences between two sub-periods: the early 1990s and the late 2000s.[4] To avoid small sample sizes and to reduce the effect of aggregate temporary shocks, we include more than one cross-section/year in each of the sub-periods whenever possible. In the analysis, we use, on average, about six surveys per country.[5] Further details on these surveys are provided in the Online Appendix.[6]

Household surveys in Latin America are one of the few available sources to analyze schooling decisions for different cohorts and time periods. They also allow us to build measures with common definitions that are comparable across countries. They cover people of all ages, have information on both schooling achievement and labor market outcomes, and are conducted annually.

Three alternative sources of information that could be used in the analysis are population censuses, employment surveys, and administrative data of the education systems. We decided against the use of these for several reasons. First, population censuses are conducted only every 10 years, are not publicly available for all countries in the region, and often lack information on labor market variables (typically wages).[7] Second, employment surveys have limited information on schooling data and usually do not include population under 12 years of age. Third, schooling

[3] The surveys include individual-level data from Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, El Salvador, Uruguay, and Venezuela.

[4] The early 1990s refer to years circa 1990-1995, while the late 2000s refer to years circa 2006-2010. See Table 2 in the Online Appendix for further details.

[5] For the Dominican Republic, Guatemala, and Paraguay, we had no information for the period 1990-1995, while for Ecuador we were missing information for the periods 1990-1995 and 2000-2005.

[6] The Online Appendix for this paper can be found at www.matiasbusso.org/papers along with a dataset of all the statistics described in this paper. The Online Appendix also contains supplemental statistics.

[7] Information on wages is relevant in this analysis as a possible explanation of school dropout.

administrative data lack information on individuals out of the school system. They also vary greatly across countries in terms of the level of disaggregation, coverage, quality, and availability, making a comparative analysis, like the one pursued in this paper, unfeasible.[8]

The main drawback of household surveys in Latin America is that questionnaires and sampling definitions vary somewhat across countries and, in some cases, have been changed during the period of analysis for the same country.[9] To the extent possible, we make country samples comparable by keeping geographical areas constant and unifying the legal starting/finishing age in each school cycle. In terms of geographical areas, we drop rural observations in Bolivia, because the household survey in the early 1990s covered urban areas alone. In the case of Argentina and Uruguay, values are calculated only for urban areas.[10] Therefore, statistics for these three countries are less comparable, in the sense that they only capture the situation in urban areas. All calculations are done taking into account year-country specific weights for computing national representative values.

Latin American educational systems differ across countries in terms of starting/finishing school age. We address this issue by homogenizing variables and sample definitions. In particular, we use information on starting primary school age, duration of primary school, and duration of secondary school to build three country-specific age intervals: primary, secondary, and post-secondary schooling ages. We also consider that the semester of birth determines the exact date that any given individual begins school. Since the date of birth is usually not observed, we construct the primary school interval by only considering children that are at least one year older than the primary school starting age and are younger than the age required for starting secondary school. The secondary school interval groups persons with secondary-starting age to secondary-finishing age.[11]

[8] Estimates of graduation and dropout rates are affected by the source of information analyzed. Heckman and LaFontaine (2010) estimated high school graduation rates in the United States by applying a unified methodology to different sources of data. They argued that, in the United States, household surveys can result in an overestimation of graduation rates (because they do not include military or incarcerated populations), while administrative data can lead to an underestimation of graduation rates.

[9] For example, in Argentina, *Encuesta Permanente de Hogares* was changed to *Encuesta Permanente de Hogares Continua* in 2003, or Colombia moved from *Encuesta Continua de Hogares* to *Gran Encuesta Integrada de Hogares* in 2006.

[10] Table 2 of the Online Appendix of this paper and the accompanying dataset provide more detail on which surveys are urban and which are national.

[11] The Online Appendix also presents the results for the post-secondary school population, which refers to people older than the secondary school finishing age but younger than 26 years.

We use two auxiliary sources of information. First, we compile a set of measures of schooling indicators from UNESCO, including the number of teachers, expansion of mandatory education, enrollment in private schools, etc. Second, we use data from the Program for International Student Assessment (PISA) to measure school quality and relate it to the observed trends in enrollment and graduation.

3. Measurement and Definitions

Ideally, the computation of school enrollment, graduation, and dropout rates should use longitudinal data of the representative sample of a country's population, which allows the researcher to follow the same individuals over time and observe their transition from one state (e.g., being in school) to another (e.g., graduating or dropping out). Although some household surveys in Latin America include panel data sets, they track individuals for relatively short periods of time (up to around two years) and suffer substantial attrition. Thus, the estimates in this paper are calculated using multiple cross-sections. For example, the secondary school graduation rate of a country in a given year is calculated as the number of people within a specific age range that report having completed secondary school divided by the total number of people in that age range.

Formally, for schooling level $k \in \{p$ = primary, s = secondary$\}$, let E_k and D_k denote the event of being enrolled and of not being enrolled in schooling level k, respectively. G_k denotes the event of having graduated from that schooling level; L_k, the event of lagging behind more than one year in that schooling level (according to the individual's age relative to the legal starting/finishing age); A_k, the event of being in the legal age group corresponding to schooling level k; and F_k, the event of having an age equal to the legal finishing age from schooling level k plus one.

The function $N\ (X|Y)$ provides the number of people for whom event X holds conditional on the occurrence of event Y. We can estimate different probabilities of events $\{E_k, G_k, D_k, L_k\}$ by using sample analogues. We call unconditional probabilities those that provide information about an individual in a certain age group regardless of his past schooling achievement. Conditional probabilities, on the other hand, capture the probability of an event for particular subgroups within an age group (e.g., the percentage of individuals of secondary school age who graduated from the primary school level). Table 1 specifies the definitions of the conditional and unconditional rates measured in this paper.

Table 1. Enrollment, Graduation, Dropout and Overage Measures

	Unconditional	Conditional
Enrollment rate in school level *k*	$\hat{P}(E_k) = \frac{N\ (E_k \vert A_k)}{N(A_k)}$	$\hat{P}(E_k \vert\ G_{k-1}) = \frac{N\ (E_k \vert A_k, G_{k-1})}{N(A_k,\ G_{k-1})}$
Graduation rate from school level *k*	$\hat{P}(G_k) = \frac{N(G_k \vert F_k)}{N(F_k)}$	$\hat{P}(G_k \vert\ E_k) = \frac{N(G_k \vert F_k, E_k)}{N(F_k,\ E_k)}$
Dropout rate from school level *k*	$\hat{P}(D_k) = \frac{N(\neg E_k \vert A_k)}{N(A_k)}$	$\hat{P}(D_k \vert\ G_{k-1}) = \frac{N(\neg E_k\ \vert A_k, G_{k-1})}{N(A_k, G_{k-1})}$
Overage rate in school level *k*	$\hat{P}(O_k) = 1 - \hat{P}(D_k) - \frac{N(\neg L_k \vert A_k)}{N\ (A_k)}$	$\hat{P}(O_k \vert\ G_{k-1}) = 1 - \hat{P}(D_k \vert\ G_{k-1}) - \frac{N(\neg L_k \vert A_k, G_{k-1})}{N\ (A_k, G_{k-1})}$

Thus, the secondary school unconditional enrollment rate $\hat{P}(E_s)$ is defined as the number of secondary school age individuals who are enrolled in school, $N\left(E_s \vert A_s, G_p\right)$, divided by the population of secondary school age, $N(A_s)$.[12] In contrast, the secondary school conditional enrollment rate, $\hat{P}\left(E_s \vert\ G_p\right)$, divides by the population of secondary school age who have completed primary school, $N\left(A_s, G_p\right)$.

Similarly, the secondary school unconditional graduation rate, $\hat{P}(G_s)$, is calculated as the population that, being one year older than the legal finishing age for secondary school, has graduated from secondary school, $N(G_s \vert F_s)$, divided by the population of individuals who are one year older than the legal graduation age at the secondary school level, $N(F_s)$. This ratio is a relevant indicator of the efficiency of the education system as a whole, but it does not capture the graduation rate among those that did enroll in or were eligible to enroll in secondary school. The reason is that some of the individuals in this age range did not complete primary school and consequently were not entitled to begin secondary school. To account for this, the conditional graduation rate uses as the denominator the population that is one or more years older than the

[12] Age ranges are defined according to the legal starting and finishing age in each country, as explained above.

secondary school legal finishing age, and that has completed primary school and enrolled in secondary school. This indicator is a better proxy of the efficiency of education systems at the secondary school level. It could be true that while the conditional secondary school graduation rate improves, the unconditional rate worsens. This is possible if greater school abandonment happens before students graduate from primary school, and simultaneously, a larger proportion among those enrolled in secondary school graduates.

The unconditional dropout rate at the secondary school level is calculated as the population of secondary school age that is not enrolled in secondary school, divided by the population of secondary school age, $N(\neg E_s|A_s)/N(A_s)$.[13] The conditional dropout rate in secondary school conditions on having finished primary school, G_p. That is, it uses as the denominator the population with secondary school age that has completed primary education. Once again, the unconditional rate captures the overall dropout rate among secondary-age youths, while the conditional rate measures abandonment among those who have been enrolled in secondary school at some time.

Finally, the secondary school overage rate is the proportion of people that are still enrolled in secondary school, but lag behind schedule in terms of completed education years. Using the same criteria as above, the unconditional overage rates are computed as a proportion based on individuals of secondary school age, and the conditional overage rates are based on the subgroup that has graduated from primary school.[14]

4. Patterns: A Glass Half Full

We use comparable estimates across countries and in time of the rates included in Table 1 to describe the main trends (rather than levels) in secondary schooling in Latin America in 1990–2010. We also analyze changes in primary schooling, because these changes affect the results observed later in the schooling cycle.

[13] Note that, by construction, the unconditional dropout rate is the complement of the unconditional enrollment rate.
[14] Analogous criteria were applied to enrollment, graduation, and dropout rates at the primary school level. However, in this case, the conditional and unconditional rates are the same, since in general, for the years and countries included in this study, there were no prerequisites (in terms of schooling) to enroll in primary school. This changed in some countries after reforms were implemented for the mandatory years of education. However, in some instances, the reforms are relatively recent and might not have affected the cohorts analyzed in this paper.

To give a comprehensive picture of the education systems in the 18 Latin American countries, Table 2 presents the unconditional probabilities of enrollment, graduation, dropout, and overage rates in the early 1990s and the late 2000s.[15] The conditional and unconditional rates defined in Table 1 (described in detail later in this section) can be calculated from these numbers. The unconditional probabilities in Table 2 provide an initial broad view of the levels and changes in primary and secondary schooling outcomes in Latin America.

Overall trends are positive in most indicators and in most countries. For primary schooling, enrollment on time increased from 81 percent to 89 percent (column [1]), and the overage rate decreased from 13 percent to 9 percent (column [2]). Graduation rates in primary schooling increased from 65 percent to 76 percent (column [3]). This implies that, compared to two decades ago, more children are able to start secondary schooling on time. The percentage of primary school graduates that abandoned school during the transition to secondary education (i.e., who never enrolled in secondary school) decreased (column [6]), and primary school graduates that enrolled in secondary school, but left before graduating, slightly increased (column [7]). This indicates that dropouts in secondary school occur later in the schooling cycle than they did in the early 1990s. Enrollment on time in secondary school increased from 45 percent to 59 percent (column [8]), and the overage rate remained unchanged (column [9]). Graduation rates in secondary school improved, both among secondary school-aged students (column [10]) and among older students (column [15]).

Next, we extend the analysis of trends in educational outcomes for secondary schooling in three ways: we compare conditional and unconditional rates, we analyze the timing of dropout, and we study changes in educational outcomes by gender, urban-rural areas, and income quintiles.

4.1. Increase in the Secondary School Graduation Rate

Table 3 shows the changes in secondary school educational outcomes following the definitions described in Table 1. Both conditional and unconditional enrollment in secondary schooling increased in all countries during the analyzed period. On average, the unconditional enrollment rate increased 14 percentage points, and the conditional enrollment rate increased 7 percentage

[15] Tables and figures other than Table 1 appear at the end of the paper.

points, thus indicating that part of the higher unconditional enrollment occurred among individuals that never enrolled in secondary school. The greatest improvements are observed in Brazil and Ecuador (33 percentage points in each case). In both cases, the unconditional enrollment rate started at low levels (below the Latin American average) in the early 1990s. In Brazil, however, most of the change happened in primary school, as indicated by the smaller increase in the conditional enrollment rate compared to the unconditional enrollment rate. Peru, Bolivia, and Uruguay showed the smallest increase in enrollment in the sample, but all countries started from relatively high levels (compared to the Latin American average) in the 1990s.

Unconditional graduation rates also increased in all countries. On average, the unconditional graduation rate increased 14 percentage points. Colombia and Brazil showed the greatest improvements (more than 30 percentage points), starting from low levels at the beginning of the period. Uruguay, Costa Rica, and Bolivia showed the lowest increases in the sample (less than 10 percentage points). Bolivia started from a high graduation rate in the 1990s, but Uruguay and Costa Rica showed (and maintained) graduation rates below the regional average. Conditional graduation rates also increased, thus indicating that observed increase in the proportion of secondary school graduates responds not only to having more youths in school, but also to a greater efficiency of the education systems in preventing early dropout. Colombia showed the highest increase in the conditional graduation rate, while Ecuador and Costa Rica showed slight decreases in this indicator. For the latter two countries, the higher proportion of secondary school graduates is associated with larger enrollment (explained in more detail in the following section).

With the exception of conditional dropout rates in Nicaragua and Peru, both unconditional and conditional dropout rates decreased in all countries in our sample. While 41 percent of the secondary school-aged population dropped out from school in the early 1990s, currently around 30 percent of this age group leaves school before graduation. Among the individuals who completed primary school, 23 percent dropped out in the early 1990s, and 16 percent, in the late 2000s. Ecuador had the greatest decrease in dropout (both conditional and unconditional rates), followed by Brazil and Colombia (showing, as in the case of graduation rates, a greater change in the unconditional dropout rate than in the conditional dropout rate).

Finally, average overage rates also decreased (3 percentage points), indicating that a lower proportion of students (both among the entire secondary school-aged population and among those who started secondary school) is lagging behind and thus, students have, on average, a higher probability of graduating on time. A few countries, such as Argentina, Chile, Costa Rica, and Uruguay, showed an increase in overage rates.

4.2. Delayed Dropping out in the Schooling Cycle

The fact that both the conditional and the unconditional graduation rates improved, on average, and that the overage rate decreased, indicates that dropping out from primary school might be decreasing, and students might be staying longer in the education system. The identification of the stage of the schooling cycle at which students drop out with the highest probability has important implications for determining the causes of school abandonment and for designing effective policies to prevent it.

Table 4 estimates the probability of dropping out of school at different times of the schooling cycle (early primary, during primary, in transition to secondary, early secondary, during secondary, or late secondary). The results show that dropouts tend to occur later in the school cycle than they did in the early 1990s. As primary school enrollment and graduation increased, more students met the requirements to attend secondary school, and therefore, the time at which school dropout rates were the highest shifted from late primary and the first cycle of secondary schooling in the early 1990s to the transition to secondary and the first cycle of secondary schooling, respectively, in the late 2000s. In the early 1990s, 41 percent of secondary school dropouts occurred during primary schooling, while in the late 2000s, the early dropout rate fell to 27 percent. The proportion of dropouts that quit school in secondary school, rather than primary school, increased.

Although all the analyzed countries show the same pattern, some differences are evident among them. As shown in Table 4, countries could be divided into three groups according to the time in the schooling cycle when the highest dropout rate occurs. Most dropouts in Group 1 (Argentina, Chile, Mexico, Panama, and Uruguay) occurred during secondary schooling (particularly early secondary). Only 27 percent of students that dropped out of school in these countries did so during their primary schooling or during the transition to secondary school. However, this is not true for countries where a larger proportion of dropouts leave the school system in the late primary stage or during the transition between primary and secondary schooling. In Group 2 (Colombia, Costa Rica, Ecuador, Peru, Paraguay, and Venezuela), almost one third of the dropouts occur during the transition to secondary schooling, and in Group 3 (Bolivia, Brazil, Dominican Republic, Guatemala, Honduras, Nicaragua, and El Salvador), around 40 percent of dropouts occur in primary school.

These results are also shown in Figure 1, which presents the probability of completing a certain number of years of education, conditional on not having graduated from secondary school. Panel A shows the average for Latin America in the two time periods. The curve for the late 2000s lies above that for the early 1990s, which shows that students stay in school longer. The part of the curve between 0 and 6 years of education is flatter for the late 2000s than for the early 1990s, indicating that a larger fraction of students (who did not complete secondary schooling) completed at least 6 years of education. Panels B and C in Figure 1 distinguish the three groups of countries mentioned in Table 4 once again. In Group 1, as mentioned above, almost all dropouts complete 6 years of schooling, but leave in the early years of secondary school. Countries in Group 3 start losing a notable proportion of dropouts very early in the education cycle. Countries in Group 2 fall between these two patterns. Panel C clearly shows the large heterogeneity among countries in the region in terms of the time when school dropouts occur.

4.3. Persisting Gender, Regional, and Income Achievement Gaps

Table 5 shows the average gap in secondary schooling graduation rates for different groups (gender, region, and income). Latin American women, for example, achieve a higher graduation rate than men, and that gap increased over the last two decades (from 6 percentage points to 9 percentage points). The increase in the gender gap in graduation rates is observed in most countries in our sample (exceptions are Argentina, Bolivia, and Colombia) and for both conditional and unconditional graduation rates.

Schools in rural areas show considerably lower graduation rates than those in urban areas, and that gap remained almost unchanged (or increased slightly). Unconditional graduation rates in urban areas, for example, are around 26 percentage points higher than in the rural areas (slightly up from about 25 percentage points in the early 1990s). Only two countries in our sample (Chile and Costa Rica) could significantly reduce the urban-rural gap in graduation rates over the last two decades.

The secondary school graduation gap between income quintiles, on average, also shows disappointing results. Students from the highest income quintile have a secondary school graduation rate 33 percentage points higher than students from the lowest income quintile. This gap has increased around 7 percentage points since the early 1990s. A similar pattern is observed for the conditional graduation rate. Most countries showed an increase in the graduation gap between income quintiles. In Brazil, for example, where remarkable improvements were made in terms of enrollment and graduation rates, the graduation gap between the highest- and lowest-income students increased 20 percentage points, indicating that the benefits mainly affected the richest groups. The gap in the conditional graduation rate remained almost unchanged, which shows that the education system in Brazil has been equally efficient in preventing dropouts among high- and low-income students once they have enrolled in secondary school. Chile, Colombia, Mexico, Nicaragua, and Venezuela were able to reduce the (unconditional) graduation gap among income quintiles.

5. Explanations

Next, we propose two types of explanations for the educational improvements and, in doing so, we also posit some of the challenges that the region will likely face in the next decades. We first argue that the patterns previously described were partly driven by changes from the supply side: an increase in public spending allocated to education, higher enrollment and graduation rates for primary schooling that brought a larger share of students to the doors of secondary schools, and improved effectiveness of secondary schools. In addition, there was also an increase in the demand for secondary schooling driven by an increase in the expected returns to secondary education.

5.1. Increased Public Spending on Education

In Latin America, education is predominantly provided via publicly administered schools. Table 6 presents some basic supply side statistics. About 75 percent of students attend public schools that typically do not charge tuition from families and, depending on the country, they are instead financed with tax revenue from the central, state, or municipal government. The most notable exception to this financing scheme is Chile, which has a voucher system that provides subsidies to families that can (at least potentially) choose between public and private schools.

The previously documented increases in enrollment have been driven, on average, by equal expansions of public and private schools. Even though this holds for most countries, there are a few exceptions. Costa Rica and Bolivia, for instance, have experienced large expansions of their public school system accompanied by contractions of the private provision of education, while Chile and Uruguay have experienced the opposite (an expanding private sector and a declining public sector).

These expansions in public and private enrollments have been fueled by an increase in public spending on education. Columns [4] and [5] show the level and change of public spending per student over GDP per capita. Spending per student increased at a higher rate than did GDP per capita in most countries, both in primary and secondary schooling. Argentina and Brazil are noticeable examples, with 37 and 66 percent change in relative spending, respectively, that basically took the level of spending on education relative to the GDP to levels observed in countries with the highest performance in international student assessments. However, the region still allocates considerably fewer resources to education than developed economies, both relative to GDP per capita and, naturally, in absolute terms.

This expansion on the supply side seems to have compensated for the increase in demand. Despite the increase in demand, the student-teacher ratio in the region declined about 6 percent over the last decade (columns [6] and [7]). This decline is actually observed in most countries. In terms of levels, though, the student-teacher ratio in the region is double that of the best-performing countries and also shows great heterogeneity, ranging from 12 students per teacher in Argentina to 31 in Nicaragua.[16]

Another possible explanation for the improvement in education outcomes attributable to the supply side concerns changes in the mandatory years of education. Indeed, Table 2 in the Online Appendix shows that several countries in the region increased the number of mandatory years of schooling by changing either the mandatory entry age for primary school or the finishing age for secondary school. Chile was the only country in Latin America to increase the number of mandatory years of education during the 1990s, while Argentina, Brazil, and Uruguay did so during the 2000s. During the 2000s, Argentina, Nicaragua, and Uruguay increased the age

[16] In addition, teacher-related issues appear to be pose important supply side constraints for the region. Levy and Schady (2013) argued that the quality of teachers in the region is relatively low. Mizala and Ñopo (2012) showed that teachers earned lower wages compared to that earned by other professions within the same country, and that there were fewer human capital requirements for the teaching profession.

at which mandatory education ends, while the Dominican Republic and Paraguay decreased the entry age for primary education from 7 to 6 years during the 1990s.

Thus, Latin American countries consciously implemented changes in their education systems that are consistent with the improvements in enrollment, graduation, and dropout rates over the last two decades. These changes affected the supply side of the schooling system, increasing public spending on education and implementing institutional reforms to increase access.

5.2. Increase in the Number of Students Eligible to Attend Secondary School

The probability of graduating from secondary school on time can be expressed as the product of the conditional and unconditional probabilities defined in Section 3 above. That is,

$$P(G_s) = P(G_s|E_s) \times P(E_s|G_p) \times P(G_p|E_p) \times P(E_p)$$

where $P(\cdot)$ is a probability function, G_j denotes the event of graduation from school level j = {primary (p) or secondary (s)}, and E_j denotes the event of enrollment. Following Heckman and Lafontaine (2010), we decompose the change in secondary school graduation rate, $\Delta P(Gs)$, into the following components:[17]

$$\Delta P(Gs) = T_1 \Delta P(G_s|E_s) + T_2 \Delta P(E_s|G_p) + T_3 \Delta P(G_p|E_p) + T_4 \Delta P(E_p) + T_5$$

Table 7 shows the result of this decomposition. The first column shows the total change in the secondary school graduation rate, while columns [2]-[6] show each of the five terms in the decomposition.

The increase in enrollment in primary schools partly explains the increase over the last two decades in the secondary school graduation rate (as shown in columns [4] and [5] of Table 7). On average, 30 percent (4 out of 14 percentage points) of the increase in the secondary school graduation rate was explained by improvements in primary school. This pattern holds for most countries, including Ecuador, Brazil, El Salvador, Costa Rica, Nicaragua, Honduras, and Mexico.

[17] $T_1 = P(E_s|G_p)\, P(G_p|E_p)\, P(E_p), T_2 = P(G_s|E_s)\, P(G_p|E_p)\, P(E_p), T_3 = P(G_s|E_s)\, P(E_s|G_p)\, P(E_p), T_4 = P(G_s|E_s)\, P(E_s|G_p)\, P(G_p|E_p)$ and $T_5 = F[G_j, E_j]$, $F(.)$ is a cross-product function composed of the sum of all the possible combinations of probabilities and changes. For computations, levels are fixed at those of the first year in the sample.

Indeed, countries with the greatest secondary school graduation rate increases (for example, Brazil, Colombia, or Venezuela) also show the greatest increases in primary school graduation rates, and countries with the lowest increases in secondary school graduation rates (Uruguay or Chile) show the same patterns in primary education. In other words, higher primary school completion rates brought more students to the doors of secondary schools. Naturally, it could be true that policies aimed at keeping children in school until graduation jointly affect both levels of schooling. Still, achieving the first milestone in primary school necessarily leads more students to be ready for secondary education, possibly having a cascade effect in secondary school. In principle, it is likely that the "marginal student" is typically more disadvantaged than the students already in primary school. This poses new challenges to secondary schools that have to increasingly work with students of more heterogeneous backgrounds, who are also more likely to drop out.

5.3. Increase in the Efficacy of Secondary Schooling

Another important factor explaining the increase in secondary school graduation rates is the improved effectiveness of secondary schools in the region in two dimensions: capture and graduation.

As column [3] of Table 7 shows, about 14 percent (2 out of 14 percentage points) of the improvement in secondary school graduation rates is explained by the fact that secondary schools in the region are able of capturing a larger proportion of students who complete primary school. This explanation is particularly likely for Argentina, Ecuador and Costa Rica.

More important, however, has been the increase in the efficacy of secondary schools in retaining their graduate students. Column [2] of Table 7 shows that on average, 36 percent (5 out of 14 percentage points) of the change in secondary school graduation rates was primarily due to this factor. In Chile, Peru, and Uruguay, this increased efficacy explains more than 80 percent of the increase in secondary school graduation. At the other end of the spectrum, Ecuador and Costa Rica showed a decline in the capacity to keep students in school.

Part of the explanation for these increases in primary school graduation rates and secondary school efficacy lies in the expansion over the last 20 years of conditional cash transfer programs (CCTs) in the region. These programs transfer cash to families and in exchange require that children are enrolled in and attend school. Typically, the target population of CCTs is individuals who should be attending primary and/or secondary school. Many studies have analyzed the impact of CCTs on schooling. Fiszbein and Schady (2009, p. 129) reviewed the relevant literature and found that "virtually every [CCT] program that has had a credible evaluation has found a positive effect on school enrollment." The impacts on enrollment reported in their study range from 0.5 to 12.8 percentage points. There is, however, large heterogeneity. Impacts are larger for populations with lower baseline enrollment and are larger for students transitioning from primary to secondary school (as opposed to students in primary or secondary school).

5.4. Demand Side: Increase in the Payoff of Completing Secondary School

The increase in the secondary school graduation rate could be associated to an increase in the payoff of completing secondary school. Figure 2 shows the average returns to education in Latin America from 1990 to 2010. Returns to secondary education were computed as the difference between the log wages of workers with complete and incomplete secondary education (excluding the population with complete primary education or less). Returns to tertiary education were calculated as the difference between the log wages of workers with tertiary education and those with complete secondary education. For secondary school, returns were calculated for two groups of people: 20–26 years old (young) and 26–55 years old (old). These two returns were included to try capturing differences in both the entry level wage and the permanent income; ex ante, it is hard to argue which of these affects the decision to stay in school. As Figure 2 shows, returns grew during the 1990s. In the early 2000s, secondary school returns for young adults started to decrease, and a few years later, returns for prime-age workers, to both secondary and tertiary schooling, followed suit.[18]

An extensive portion of the literature discusses whether labor market returns provide incentives to stay in school.[19] Several studies have analyzed the causal impact of observed and perceived positive returns to education on enrollment and graduation. Foster and Rosenszweig (1996) used an exogenous technical change in India, which led to higher primary school returns,

[18] Manacorda, Sánchez-Páramo and Schady (2010) and Gasparini et al. (2011) found that secondary education returns fell during the 1980s and 1990s relative to primary education due to an unprecedented rise in the supply of workers having completed secondary-level education. Figure 2, however, indicates a different pattern. It compares workers that finish secondary education to secondary school dropouts, which is a more relevant comparison for a student making the decision about dropping out. The difference is therefore explained mainly by sample selection.

[19] See Murnane (2013) for a thorough review of this literature.

thus resulting in higher levels of schooling. Jensen (2012) provided labor market opportunities for women in randomly selected rural Indian villages and concluded that increased labor access has positive effects on schooling. In addition, some studies found that if the returns for unskilled labor (workers with less than completed secondary school education) increased, then the students have more incentives to drop out (Foster and Rosenszweig, 2004; Black, McKinnish and Sanders, 2005; Edmonds, Pavcnik and Topalova, 2010).

Perceived returns also seem to matter. Jensen (2010) conducted a survey experiment on eighth-graders in the Dominican Republic and found that students who randomly received information about higher returns to education completed 0.20–0.35 more years of schooling. Eckstein and Wolpin (1999) estimated a structural model of high school attendance and work decisions. They concluded that students who drop out of high school are less motivated and have lower expectations regarding the rewards of education. In a recent experiment in Chile, Dinkelman and Martínez (2013) found a causal relationship between providing children with information about college financial aid and secondary school enrollment. In this case, students decide to study because they perceive a concrete possibility of enrolling in tertiary education, and this encourages them to graduate from secondary school.

This positive relation between returns to education and secondary school graduation also seems to holds in our sample of countries. With our data, we cannot establish causality, but we can at least establish an indicative correlation. We group people in cells of income quintile, gender, and rural/urban for each country and year in our sample. A total of 1,636 cells were created for the entire region during two decades. For each cell, we compute secondary and tertiary wage returns and unemployment rates for young and old workers (as defined before) and the secondary school graduation rate of students who are about 19 years old.[20] Using the variation among these groups, we then estimate a regression model:

$$GR_{gtj}^{19} = \gamma_0 + \gamma_1 \overline{\omega}_{gjt}^{r} + \gamma_2 \overline{u}_{gjt}^{r} + \mu_{jt} + \varepsilon_{gjt}$$

[20] Strictly speaking, this refers to students who are (legal secondary school graduation age + 1) years old.

where GR^{19}_{gtj} is the graduation rate of the 19-year old in group g in country j in year t. $\overline{\omega}^{r}_{gjt}$ and $\overline{u}^{r}_{gjt}$ are the returns to schooling[21] and unemployment rate for the three reference groups r (all older than 19 years) respectively, described in Figure 2; μ_{ij} is a country-year fixed effect; and ε_{gtj} is an error term. Table 8 reports the results. Column [1] shows the results of the model for all years with the average return and the average unemployment rate among the three reference groups as independent variables. Columns [2]-[4] show the separate estimations for each reference group. Columns [5] and [6] estimate the same model in column [1], but disaggregate the sample by decades. The correlation between wage returns and secondary school graduation is positive, while that between the unemployment rate and graduation is negative for all reference groups and for both decades.

6. Challenges: The Half-Empty Glass

A secondary school diploma is an essential requirement for entering today's highly competitive labor market. Even though the region experienced important improvements in educational outcomes during the last two decades, which were fueled by changes in supply and demand for education, it still faces big challenges in catching up with developed economies. Graduation rates are still very low by international standards, there are large educational achievement gaps within countries, and Latin American students rank in the lowest percentiles of international tests such as the PISA.

6.1. Low and Heterogeneous Graduation Rates

Secondary school graduation rates in most developed countries are above 70 percent. Table 9 presents educational outcome statistics for the late 2000s. Latin America still displays a low secondary school graduation rate: only 46 percent of the secondary school age students actually graduate on time, and among those that start secondary school, only 60 percent finish. Chile is probably the only country currently displaying graduation rates similar to those of the more

[21] The average return was computed as the mean of $\beta_1, \beta_2,$ and β_3. β_1 was estimated only for the people who were [(school finishing age + 2), 26] years old in the model $W_i = \beta_0 + CS_i\beta_1 + age_i\tau + u_i$. W_i is the logarithmic wage of the individual, CS_i is an indicator that takes the value one if the individual has completed secondary schooling and 0 if he/she has not completed secondary schooling (notice that individuals with only complete primary schooling were excluded), and age_i is the individual's age. β_2 and β_3 are estimated for the population [27, 55] years in the model $W_i = \beta_0 + CS_i\beta_2 + CT_i\beta_3 + age_i\tau + u_i$, where W_i, age_i, and CS_i are the same as in the previous model, and CT_i indicates whether the individual has completed tertiary schooling.

developed economies. In most other countries, the graduation rates are much lower. In Costa Rica, Guatemala, Honduras, Nicaragua, and Uruguay, only 1 in 3 students graduate on time.

On average, only about 70 percent of those of secondary school age and about 84 percent of those that finish primary school are enrolled in secondary school. In other words, the primary challenges for Latin American countries are to improve educational outcomes in primary schooling, mainly by reducing overage, and to capture a larger proportion of students who finish primary school but never make it to secondary school. This is true for most countries, but it is especially important for Guatemala, Nicaragua, and Honduras.

Secondly, dropout and overage rates among those that enroll in secondary school (i.e., conditional rates) are relatively high at 16 and 12 percent, respectively. About 1 in 3 students who start secondary school does not graduate on time. Thus, the second challenge for the region is to improve graduation and on-time grade promotion of individuals who do start secondary school.

Table 10 shows the gaps in graduation rates. The differences in graduation rates are typically larger by income than by urban-rural divide, and, in turn, the latter are larger than the gaps by gender. On average, females have 9 percent higher graduation rates than males. This is a large gap, considering that the average graduation rate is 46 percent. This gap is relatively homogeneous within the region, with Argentina, Uruguay, Brazil, the Dominican Republic, and Nicaragua showing larger gender gaps. The urban-rural graduation gap is much more important: individuals living in urban areas have a 26 percent higher graduation rate than those living in rural areas. Regional gaps are larger in Colombia and Peru. In terms of gaps by income, persons living in households in the fifth income quintile have a 33 percent higher graduation rate than those living in households in the first income quintile.[22]

Finally, Figure 3 analyzes the timing of dropout for different gender, regional and income groups. Although women tend to graduate from high school proportionately more than men, among female and male dropouts the timing of leaving school shows no differences (panel A). On average, both men and women drop out mainly in the first years of secondary school and between the eighth and tenth school year. Students living in households in the first income

[22] Cruces, García-Domench, and Gasparini (2012) also found evidence of big income gaps in years of education, school enrollment, wage skill differential, public social expenditure, school segregation, school achievement, and other indicators/parameters.

quintile leave school earlier than those living in households in the fifth income quintile. Similarly, students in rural areas drop out of school earlier than those in urban areas.

6.2. Low Quality of Education

It has been widely documented[23] that students in Latin America perform very poorly in international standardized tests. An example of this is evidenced in the overall region's performance in the 2009 edition of PISA. Students from eight Latin American countries took the test. Table 11 shows the results for 2000 and 2009 and presents gender, regional, and income gaps for 2009. The results correspond to the country's average score in math, reading, and science, and the values are standardized to have a mean of 500 (the same as the mean for OECD member countries) and a standard deviation of 100. The last row shows the averages of countries that performed the best. Chile and Uruguay had the highest scores in the region, and Panama and Peru, the lowest. However, Latin American countries' scores were well below the OECD average and in the bottom third of all participating countries (Bassi et al., 2012). Moreover, the region's high-income students also failed to perform well enough to be comparable to OECD standards. In addition to the overall bad result, there are big gaps within countries: males performed slightly (1 percent) worse than females, students in rural schools (11 percent) performed worse than those in urban schools, and poor students (20 percent) performed worse than their relatively rich counterparts.

Hanushek and Woessmann (2012, p. 497) argued that the low quality of education in Latin America is a fundamental factor that can explain the region's underperformance in terms of growth relative to countries that were similar or poorer in 1960: "In simplest terms, while Latin America has had reasonable school attainment, the skills of students remain comparatively very poor." The emphasis of educational policy in the region seems to be on increasing access to education rather than increasing its quality. Moreover, Bassi et al. (2012) showed that not only is the region's secondary school education of low quality, but it also provides a set of skills that are not necessarily those demanded by the labor market.

[23] See, for example, Bassi et al. (2012) or Levy and Schady (2013).

Given the context (discussed in Section 5) wherein returns to secondary education have dropped or stagnated, improving the quality of education and its relevance to the labor market or the pursuit of further studies, can also increase graduation rates.

7. Conclusion

This paper documented the main patterns in secondary school graduation and dropout rates in Latin America for the period 1990–2010. We found that enrollment and graduation rates increased dramatically during this period, while dropout rates decreased. We offered several explanations for these patterns: countries have increased the resources allocated to education, they have implemented policies to help students stay in school, and returns to secondary education increased over the 1990s, thus providing economic incentives to stay in school. Despite these positive changes, graduation rates are still low, and there are remarkable (and increasing) gaps in terms of gender, income quintiles, and regions within countries. Wage returns have recently stagnated, and the region suffers from low-quality education, casting doubts on whether the positive trend can be sustained in the medium term.

Providing policy advice on how to improve educational outcomes in the next decade is beyond the scope of this paper. However, we have identified several recent meta-analyses that discuss evidence-based education interventions of policies aimed at decreasing dropout rates and improving learning. In the United States a number of early identification and intervention systems to combat student disengagement and increase graduation rates for middle-grade schools have been identified by Balfanz, Herzog and Mac Iver (2007). There have also been some initiatives in developing countries that aim at getting children into school and keeping them there (Petrosino et al., 2012). Finally, a large number of pilots and interventions have been implemented in order to improve learning in developing countries. McEwan (2013) identified 110 school-based treatments that affected language and mathematics test scores. He found that nutritional treatments, treatments that provided information to parents or students, and treatments that improved school management and supervision had small effects. The largest effects were evidenced through treatments with instructional materials, teacher training, instructional technology, smaller classes, smaller learning groups within classes, and student and teacher performance incentives.

In sum, despite the fact that Latin American educational outcomes have improved in the last 20 years, the region still faces several challenges that need to be addressed if governments want to continue increasing graduation rates. Identifying patterns, explaining them, and identifying the main challenges therein constitute the first step in that direction.

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Tables and Figures

Table 2. Education Achievement in LAC

Unconditional Probabilities of Enrollment, Graduation, Drop-out and Overage

	Primary School Age			Secondary School Age							(Finishing School age + 1) to 26 years old				
						Complete primary									
	Enrolled in primary		Graduation rate in primary	Incomplete primary		Do not attend secondary		Enrolled in secondary		Graduation rate in secondary	Some primary	Complete primary and do not attend	Incomplete secondary and do not attend	Incomplete secondary and assist	Graduation rate in secondary
	On time	Overage		Do not attend	Attend	Never attended	Attended	On time	Overage						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]
Early 1990s															
Argentina	0.95	0.04	0.84	0.02	0.13	0.13	0.05	0.60	0.06	0.41	0.04	0.21	0.15	0.07	0.53
Bolivia	0.93	0.06	0.81	0.05	0.10	0.02	0.05	0.67	0.11	0.50	0.12	0.04	0.23	0.07	0.54
Brazil	0.55	0.34	0.25	0.30	0.36	0.03	0.01	0.18	0.05	0.15	0.50	0.09	0.04	0.07	0.22
Chile	0.97	0.02	0.87	0.03	0.06	0.02	0.10	0.74	0.05	0.57	0.06	0.04	0.31	0.02	0.56
Colombia	0.73	0.20	0.52	0.09	0.21	0.09	0.04	0.33	0.21	0.21	0.14	0.17	0.22	0.09	0.35
Costa Rica	0.79	0.18	0.63	0.08	0.21	0.19	0.04	0.33	0.14	0.24	0.11	0.34	0.16	0.06	0.30
Ecuador	0.74	0.08	0.56	0.08	0.17	0.19	0.10	0.39	0.04	0.38	0.09	0.23	0.20	0.04	0.42
Honduras	0.73	0.17	0.52	0.19	0.16	0.26	0.03	0.20	0.07	0.14	0.27	0.30	0.09	0.05	0.17
Mexico	0.77	0.19	0.70	0.08	0.12	0.13	0.12	0.40	0.10	0.25	0.12	0.18	0.31	0.05	0.28
Nicaragua	0.61	0.19	0.36	0.16	0.20	0.07	0.03	0.22	0.11	0.12	0.25	0.13	0.17	0.09	0.16
Panama	0.88	0.11	0.79	0.04	0.10	0.12	0.06	0.54	0.12	0.39	0.07	0.18	0.24	0.05	0.45
Peru	0.92	0.07	0.76	0.02	0.13	0.03	0.03	0.65	0.14	0.54	0.05	0.08	0.13	0.08	0.66
El Salvador	0.78	0.10	0.58	0.20	0.11	0.05	0.09	0.42	0.05	0.29	0.25	0.09	0.22	0.03	0.29
Uruguay	0.91	0.08	0.83	0.02	0.09	0.09	0.12	0.54	0.12	0.25	0.03	0.14	0.45	0.08	0.29
Venezuela	0.86	0.12	0.70	0.06	0.16	0.07	0.04	0.50	0.15	0.31	0.09	0.17	0.25	0.08	0.37
LAC Average	0.81	0.13	0.65	0.10	0.15	0.10	0.06	0.45	0.10	0.32	0.15	0.16	0.21	0.06	0.37
Late 2000s															
Argentina	0.95	0.04	0.87	0.02	0.08	0.03	0.05	0.75	0.07	0.57	0.03	0.09	0.17	0.05	0.66
Bolivia	0.94	0.05	0.83	0.02	0.10	0.01	0.05	0.73	0.09	0.60	0.08	0.01	0.16	0.04	0.70
Brazil	0.84	0.15	0.59	0.11	0.25	0.04	0.02	0.49	0.07	0.46	0.21	0.08	0.07	0.07	0.55
Chile	0.95	0.04	0.92	0.00	0.06	0.00	0.05	0.79	0.08	0.73	0.01	0.01	0.15	0.02	0.80
Colombia	0.90	0.07	0.79	0.03	0.11	0.03	0.05	0.63	0.13	0.54	0.07	0.08	0.17	0.05	0.61
Costa Rica	0.86	0.13	0.71	0.03	0.20	0.08	0.03	0.44	0.22	0.31	0.07	0.19	0.17	0.13	0.42
Dominican Republic	0.92	0.06	0.80	0.04	0.09	0.01	0.06	0.69	0.10	0.47	0.09	0.02	0.23	0.10	0.52
Ecuador	0.96	0.02	0.84	0.02	0.08	0.02	0.11	0.72	0.05	0.52	0.05	0.17	0.16	0.06	0.55
Guatemala	0.70	0.22	0.50	0.15	0.18	0.12	0.06	0.29	0.11	0.14	0.24	0.17	0.19	0.06	0.20
Honduras	0.83	0.11	0.70	0.11	0.11	0.22	0.06	0.40	0.08	0.30	0.18	0.29	0.12	0.07	0.31
Mexico	0.95	0.04	0.90	0.02	0.05	0.06	0.15	0.64	0.06	0.42	0.05	0.10	0.34	0.03	0.46
Nicaragua	0.73	0.20	0.55	0.13	0.17	0.08	0.08	0.39	0.11	0.31	0.17	0.11	0.20	0.06	0.38
Panama	0.92	0.07	0.84	0.02	0.11	0.06	0.07	0.62	0.11	0.50	0.04	0.12	0.23	0.04	0.55
Peru	0.92	0.06	0.81	0.03	0.10	0.03	0.03	0.71	0.09	0.65	0.05	0.06	0.11	0.04	0.73
Paraguay	0.95	0.04	0.69	0.06	0.15	0.08	0.09	0.56	0.05	0.43	0.10	0.16	0.22	0.02	0.49
El Salvador	0.84	0.12	0.70	0.10	0.12	0.04	0.11	0.51	0.09	0.40	0.16	0.08	0.27	0.04	0.41
Uruguay	0.92	0.08	0.82	0.01	0.10	0.08	0.10	0.55	0.15	0.28	0.03	0.14	0.40	0.10	0.33
Venezuela	0.92	0.06	0.84	0.03	0.09	0.03	0.04	0.70	0.10	0.57	0.05	0.09	0.17	0.05	0.62
LAC Average	0.89	0.09	0.76	0.05	0.12	0.06	0.07	0.59	0.10	0.46	0.09	0.11	0.20	0.06	0.52

Note: Age intervals vary by country according to the mandatory school legal age. Columns [1] -[2] are based on population from (primary school starting age + 1) to (secondary school starting age - 1) years old. Column [3] is based on population of (secondary school starting age + 1) years old. Columns [4]-[9] are based on population from secondary starting age to secondary school finishing age. Column [10] on population with (secondary ending age + 1) years old. Columns [11]-[15] are based on population from (secondary school finishing age + 1) to 26 years old. All data are nationally representative except for Argentina, Bolivia and Uruguay, which only gather data in urban areas.

Table 3. Secondary School Educational Outcomes

	Enrollment		Graduation		Dropout		Overage	
	Unconditional	Conditional	Unconditional	Conditional	Unconditional	Conditional	Unconditional	Conditional
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
LAC early 1990s	0.55	0.77	0.32	0.51	0.41	0.23	0.14	0.15
LAC late 2000s	0.69	0.84	0.46	0.60	0.30	0.16	0.11	0.12
LAC Change (early1990- late 2000s)	0.14	0.07	0.14	0.09	-0.11	-0.07	-0.03	-0.03
Change by country								
Argentina	0.16	0.13	0.15	0.07	-0.15	-0.13	0.01	0.00
Bolivia	0.03	0.01	0.09	0.08	-0.04	-0.01	-0.02	-0.03
Brazil	0.33	0.03	0.31	0.18	-0.27	-0.03	-0.04	-0.08
Chile	0.07	0.07	0.16	0.15	-0.08	-0.07	0.03	0.03
Colombia	0.23	0.09	0.33	0.30	-0.21	-0.09	-0.10	-0.16
Costa Rica	0.19	0.18	0.07	-0.03	-0.18	-0.18	0.07	0.08
Ecuador	0.33	0.26	0.14	-0.11	-0.32	-0.26	-0.01	0.00
Honduras	0.20	0.14	0.16	0.08	-0.13	-0.14	-0.06	-0.02
Mexico	0.19	0.10	0.18	0.11	-0.16	-0.10	-0.07	-0.07
Nicaragua	0.16	-0.01	0.18	0.20	-0.01	0.01	-0.16	-0.08
Panama	0.07	0.07	0.11	0.08	-0.07	-0.07	-0.02	-0.02
Peru	0.01	-0.01	0.11	0.13	-0.01	0.01	-0.05	-0.06
El Salvador	0.13	0.02	0.11	0.05	-0.07	-0.02	-0.02	0.03
Uruguay	0.04	0.04	0.04	0.04	-0.03	-0.04	0.02	0.42
Venezuela	0.15	0.07	0.27	0.24	-0.14	-0.07	-0.06	-0.08

Note: Computations are based on population from secondary starting age to secondary school finishing age. Enrollment, graduation, dropout, and overage rates - conditional and unconditional - are computed following the definitions shown on Table 1. Early 1990s computed for years 1990-1995 and late 2000s for 2005-2010. Changes by country express the late 2000s rate minus the early 1990s rate.

Table 4. Time of Dropout

Probability of dropping out during primary and secondary school
(of people that dropped out and are not currently enrolled)

	Time of dropout	Early 1990s	Late 2000s	Change
		[1]	[2]	[3]
LAC	Early primary	0.08	0.05	-0.02
	During primary	0.33	0.22	-0.11
	Transition primary/secondary	0.18	0.21	0.03
	Early secondary	0.33	0.39	0.06
	Late secondary	0.09	0.13	0.04
Group 1	Early primary	0.04	0.03	-0.01
	During primary	0.13	0.08	-0.05
	Transition primary/secondary	0.17	0.16	0.00
	Early secondary	0.46	0.49	0.03
	Late secondary	0.20	0.24	0.04
Group 2	Early primary	0.04	0.04	0.00
	During primary	0.30	0.23	-0.08
	Transition primary/secondary	0.28	0.29	0.01
	Early secondary	0.32	0.34	0.03
	Late secondary	0.06	0.09	0.04
Group 3	Early primary	0.12	0.08	-0.04
	During primary	0.47	0.31	-0.16
	Transition primary/secondary	0.13	0.19	0.06
	Early secondary	0.25	0.34	0.10
	Late secondary	0.04	0.08	0.04

Note: Early primary = dropped between 0-1 years of education. During primary = dropped between years 1-6. Early secondary= dropped between years 6-7. During secondary = dropped between years 7-10. Late secondary= dropped between years 10-12. Country type defined by the percentage of people that dropped by the end of primary or before. Type 1 = dropped less than 20% of people. Type 2= dropped between 20 and 30%. Type 3= more than 30%. Early 1990s computed for years 1990-1995 and late 2000s for 2005-2010. Country group 1 formed by Argentina, Chile, Mexico, Panama, and Uruguay. Country group 2 formed by Colombia, Costa Rica, Ecuador, Peru, Paraguay, and Venezuela. Country group 3 formed by Bolivia, Brazil, Dominican Republic, Guatemala, Honduras, Nicaragua, and El Salvador.

Table 5. Change in Graduation Gap

	Female-Male		Urban-Rural		Quntile 5- Quintile 1	
	Unconditional	Conditional	Unconditional	Conditional	Unconditional	Conditional
	[1]	[2]	[3]	[4]	[5]	[6]
LAC 1990	0.06	0.05	0.25	0.20	0.27	0.19
LAC 2010	0.09	0.08	0.26	0.21	0.33	0.28
LAC Change 1990-2010	0.03	0.03	0.01	0.01	0.07	0.09
Change by country						
Argentina	-0.08	-0.14	-	-	0.08	0.09
Bolivia	-0.01	-0.03	-	-	0.14	0.19
Brazil	0.07	0.02	0.12	0.01	0.20	-0.01
Chile	0.05	0.06	-0.31	-0.29	-0.03	0.01
Colombia	-0.03	-0.09	0.16	0.15	-0.01	-0.10
Costa Rica	0.04	0.04	-0.11	-0.12	0.07	0.08
Ecuador	0.00	0.00	0.01	0.12	0.07	0.35
Honduras	0.06	0.08	0.11	0.12	0.26	0.47
Mexico	0.02	-0.01	0.00	0.03	-0.02	0.04
Nicaragua	0.21	0.37	0.08	0.01	-0.03	-0.21
Panama	0.00	0.02	0.04	0.07	0.05	0.06
Peru	0.00	-0.03	0.01	-0.02	0.08	0.09
El Salvador	0.03	0.02	0.00	0.02	0.06	0.09
Uruguay	0.09	0.11	-	-	0.16	0.19
Venezuela	0.00	-0.02	-	-	-0.06	-0.05

Note: Computations are based on population from secondary starting age to secondary school finishing age. Enrollment, graduation, dropout, and overage rates - conditional and unconditional - are computed following the definitions shown in Table 1. Changes by country express the 2010 rate minus the 1990 rate. Rural-Urban and Male-Female identified by data provided in each survey. Income quintiles constructed using primary and secondary activity household winsorized wages.

Table 6. Supply

	% Public Enrollment	Change in enrollment 2000-2010		Expenditure per student (% GDP)		Student-teacher ratio	
	Late 2000s	Public	Private	Late 2000s	Change 2000-2010	Late 2000s	Change 2000-2010
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Secondary School							
Argentina	0.72	0.01	0.05	23.61	0.37	11.95	-0.14
Bolivia	0.87	0.28	-0.50	15.53	0.37	18.17	-0.23
Brazil	0.87	-0.08	0.01	19.34	0.66	17.39	0.03
Chile	0.44	-0.10	0.11	14.34	0.02	23.14	-0.20
Colombia	0.77	0.20	0.17	13.27	-0.06	26.41	0.16
Costa Rica	0.90	0.32	-0.17	13.57	-0.32	16.53	-0.13
Dominican Republic	0.75	0.17	0.18	6.08	0.47	27.16	0.02
Ecuador	0.67	0.24	0.30	16.64	1.76	13.40	-0.01
El Salvador	0.83	0.17	-0.03	8.91	0.01	26.32	-0.10
Guatemala	0.30	0.55	0.37	5.62	0.27	15.77	0.09
Honduras	0.75	0.01	-	-	-	-	-
Mexico	0.85	0.14	0.05	14.31	-0.12	17.86	0.03
Nicaragua	0.76	0.24	-0.07	5.58	0.88	30.84	-0.06
Panama	0.84	0.05	0.17	15.12	-0.05	15.33	-0.04
Paraguay	0.79	0.07	-0.01	16.70	0.09		
Peru	0.77	-0.02	0.50	10.12	0.07	16.24	-0.14
Uruguay	0.85	-0.14	0.16	10.63	0.22	13.11	-0.10
Venezuela	0.73	0.15	0.27	-	-	-	-
Average LAC	0.75	0.13	0.09	13.09	0.29	19.31	-0.06
Top PISA	0.91	-0.04	0.06	22.21	-0.01	10.80	-0.17

Note: Data source is UNESCO stats. Top PISA countries includes Switzerland, Poland, and Hong Kong (countries ranked in PISA top 15 and with sufficient information in UNESCO Stats). Columns [1] -[3] use information on number of students enrolled in public and private schools. Columns [4] and [5] use information on public expenditure per pupil as a % of the GDP per capita in primary and secondary. Columns [6] and [7] use information on pupil-teacher ratio in primary and secondary. Calculations done by the authors.

Table 7. Changes in Graduation Rates in LAC

Conditional Probabilities

	Secondary School Age					
	Δ P(Gs) [1]	Δ due to P(Gs | Es) [2]	Δ due to P(Es | Gp) [3]	Δdue to P(Gp | Ep) [4]	Δ due to P(Ep) [5]	Δ due to interactions [6]
Argentina	0.15	0.05	0.06	0.03	0.00	0.02
Bolivia	0.09	0.07	0.00	0.02	0.00	0.00
Brazil	0.31	0.04	0.01	0.17	0.01	0.08
Chile	0.16	0.14	0.01	0.01	0.00	0.00
Colombia	0.33	0.21	0.01	0.04	0.00	0.06
Costa Rica	0.07	-0.01	0.05	0.02	0.00	0.00
Ecuador	0.14	-0.06	0.12	0.08	0.01	-0.01
Honduras	0.16	0.03	0.04	0.04	0.01	0.04
Mexico	0.18	0.07	0.03	0.04	0.01	0.03
Nicaragua	0.19	0.07	0.00	0.03	0.02	0.05
Panama	0.11	0.06	0.03	0.01	0.00	0.01
Peru	0.11	0.11	0.00	0.01	0.00	0.00
El Salvador	0.11	0.03	0.01	0.05	0.02	0.01
Uruguay	0.03	0.03	0.00	0.00	0.00	0.00
Venezuela	0.27	0.17	0.02	0.04	0.00	0.04
LAC Average	0.14	0.05	0.02	0.04	0.01	0.02

Note: Columns express the terms in the decomposition of Δ P(Gs). Column [1] shows the entire change in the secondary graduation rate between early 1990s and late 2000s. Column [2] is equal to [Δ P(Gs|Es)*P(Es | Gp)*P(Gp | Ep)*P(Ep)]. Column [3] is equal to [P(Gs|Es)*ΔP(Es | Gp)*P(Gp | Ep)*P(Ep)]. Columns [4] is equal to [P(Gs|Es)*P(Es | Gp)*ΔP(Gp | Ep)*P(Ep)]. Columns [5] is equal to [P(Gs|Es)*P(Es | Gp)*P(Gp | Ep)*Δ P(Ep)]. Columns [6] is equal to the sum of the rest of the terms in the decomposition. Columns [1]-[6] use population from secondary starting age to secondary school finishing age.

Table 8. Graduation Rate, Wages and Unemployment

Dependent variable: Secondary School Graduation Rate

	All sample	Sample by Reference Group			Sample by years	
		Complete Secondary 20-26 y.o.	Complete Secondary 27-55 y.o.	Complete Tertiary 27-55 y.o.	1990s	2000s
	[1]	[2]	[3]	[4]	[5]	[6]
Wage return	0.356***	0.119***	0.250***	0.231***	0.295***	0.383***
	[0.047]	[0.033]	[0.030]	[0.040]	[0.051]	[0.051]
Unemployment	-0.187	-0.176**	-0.412**	-0.065	-0.245***	-0.156
	[0.121]	[0.080]	[0.162]	[0.068]	[0.081]	[0.151]
Constant	0.561***	0.606***	0.588***	0.559***	0.264***	0.320***
	[0.008]	[0.008]	[0.007]	[0.009]	[0.011]	[0.018]
Observations (groups)	1,636	1,602	1,623	1,584	508	1,128
R-squared	0.474	0.409	0.461	0.469	0.438	0.445

Note: The dependent variable is the graduation rate for individuals that are (final graduation age+1) years old in a cell. Each cell defined as the intersection of country, year, gender, income quantile, rural/urban. Wage return refers to the mincerian return to education estimated adjusting by age. Unemployment refers to the unemployment rate. Wage returns and unemployment in columns [1], [5], and [6] are the average of the wage return/unemployment rate for three reference groups: people who are (school finishing age+2) - 26 years old and have completed secondary school instead of dropping out; people who are 27-55 y.o. that have completed secondary instead of dropping out, and people who are 27-55 y.o and have completed tertiary school instead of secondary school. All regressions have (country x year) fixed effects. Cluster (country) standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 9. Secondary School Educational Outcomes

(Late 2000s)

	Enrollment		Graduation		Dropout		Overage	
	Unconditional	Conditional	Unconditional	Conditional	Unconditional	Conditional	Unconditional	Conditional
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Argentina	0.82	0.91	0.57	0.65	0.18	0.09	0.07	0.08
Bolivia	0.82	0.93	0.60	0.69	0.18	0.07	0.09	0.10
Brazil	0.56	0.90	0.46	0.78	0.42	0.10	0.09	0.11
Chile	0.87	0.94	0.74	0.80	0.12	0.06	0.08	0.08
Colombia	0.77	0.90	0.54	0.66	0.22	0.10	0.14	0.15
Costa Rica	0.66	0.85	0.31	0.45	0.34	0.15	0.22	0.28
Dominican Republic	0.79	0.92	0.49	0.58	0.20	0.08	0.11	0.12
Ecuador	0.77	0.86	0.52	0.60	0.23	0.14	0.06	0.05
Guatemala	0.39	0.68	0.14	0.31	0.52	0.32	0.19	0.18
Honduras	0.47	0.63	0.30	0.55	0.50	0.37	0.10	0.10
Mexico	0.70	0.77	0.43	0.50	0.29	0.23	0.07	0.07
Nicaragua	0.50	0.76	0.31	0.54	0.46	0.24	0.15	0.17
Panama	0.73	0.85	0.50	0.63	0.26	0.15	0.12	0.13
Peru	0.80	0.93	0.65	0.79	0.20	0.07	0.09	0.10
Paraguay	0.61	0.78	0.43	0.62	0.38	0.22	0.05	0.06
El Salvador	0.60	0.79	0.40	0.56	0.38	0.21	0.11	0.12
Uruguay	0.70	0.80	0.28	0.35	0.29	0.20	0.15	0.42
Venezuela	0.80	0.92	0.57	0.69	0.19	0.08	0.12	0.12
LAC Average	0.69	0.84	0.46	0.60	0.30	0.16	0.11	0.12

Note: Computations are based on population from secondary starting age to secondary school finishing age. Enrollment, graduation, dropout, and overage - conditional and unconditional - rates are computed following the definitions shown in Table 1. Late 2000s computed for years 2005-2010.

Table 10. Graduation Gap

	Female-Male		Urban-Rural		Quntile 5- Quintile 1	
	Unconditional	Conditional	Unconditional	Conditional	Unconditional	Conditional
	[1]	[2]	[3]	[4]	[5]	[6]
Gap in late 2000s						
Argentina	0.13	0.12	-	-	0.37	0.31
Bolivia	-0.02	-0.02	-	-	0.30	0.31
Brazil	0.13	0.06	0.26	0.19	0.53	0.30
Chile	0.06	0.06	0.10	0.10	0.26	0.24
Colombia	0.06	0.03	0.39	0.37	0.28	0.17
Costa Rica	0.07	0.06	0.15	0.13	0.30	0.31
Dominican Republic	0.15	0.13	0.17	0.14	0.26	0.20
Ecuador	0.07	0.07	0.32	0.31	0.35	0.32
Guatemala	0.02	0.07	0.17	0.19	0.31	0.41
Honduras	0.07	0.04	0.29	0.19	0.50	0.49
Mexico	0.07	0.07	0.19	0.16	0.23	0.19
Nicaragua	0.17	0.21	0.23	0.09	0.28	0.16
Panama	0.10	0.09	0.28	0.19	0.43	0.33
Peru	0.06	0.07	0.37	0.28	0.43	0.32
Paraguay	0.09	0.06	0.33	0.32	0.36	0.26
El Salvador	0.08	0.09	0.34	0.32	0.42	0.39
Uruguay	0.14	0.14	-	-	0.31	0.29
Venezuela	0.12	0.09	-	-	0.10	0.05
LAC Average	0.09	0.08	0.26	0.21	0.33	0.28

Note: Computations are based on population from secondary starting age to secondary school finishing age. Enrollment, graduation, dropout, and overage - conditional and unconditional - rates are computed following the definitions shown in Table 1. Rural-Urban and Male-Female identified by data provided in each survey. Income quintiles constructed using primary and secondary activity household winsorized wages.

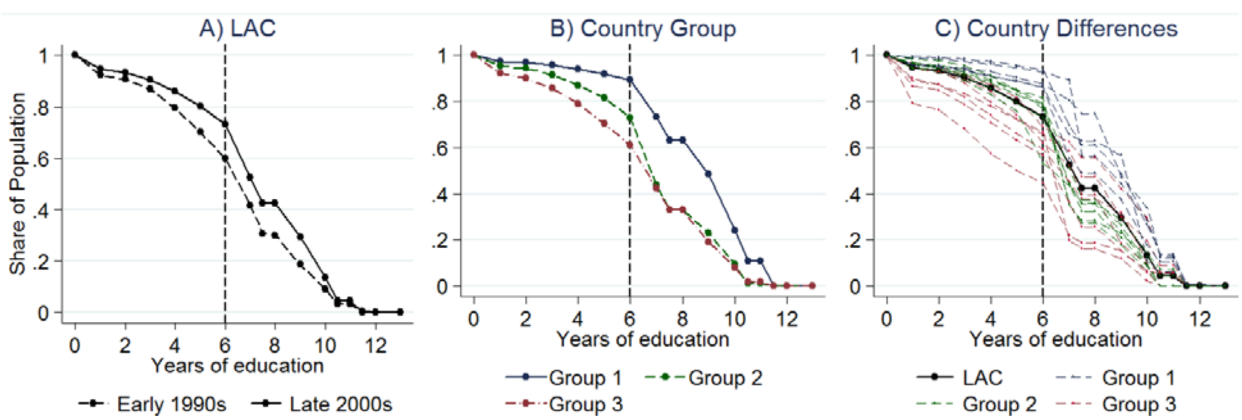
Table 11. PISA results

Country	Overall		Gender (2009)		Regional (2009)		Income (2009)	
	2000	2009	Female	Male	Rural**	Urban	Quintile 1	Quintile 5
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Argentina	400.7	395.7	400.9	389.7	376.9	421.4	350.0	442.8
Brazil	401.7	401.0	402.5	399.3	390.0	413.5	371.3	435.7
Chile	403.0	439.3	438.0	440.6	422.2	449.9	414.4	478.0
Colombia	381*	398.6	391.6	406.3	381.8	417.2	362.4	441.2
Mexico	410.3	419.9	420.7	419.1	397.9	446.5	391.2	455.9
Panama	-	368.8	373.7	363.8	347.0	416.7	334.6	406.4
Peru	317.3	368.1	368.1	368.0	336.3	420.2	310.3	429.5
Uruguay	431.*	426.6	431.4	421.2	412.0	445.5	392.6	461.7
Top PISA	508.6	519.3	524.2	514.6	506.1	532.3	505.9	527.2

Note: Reported values equal the average of the math, science, and reading scores. Average score for the OECD in 2000 was 500 and in 2009 it was 498. Scores calculated using the final student weights of the PISA database. Top PISA includes Switzerland, Poland, and Hong Kong. *Colombia 2006 and Uruguay 2003 values are used as 2000 values. Panama presented the first PISA test in 2009. ** Rural variable does not exist in the PISA database, therefore we constructed it using the size of the village and the number of nearby schools.

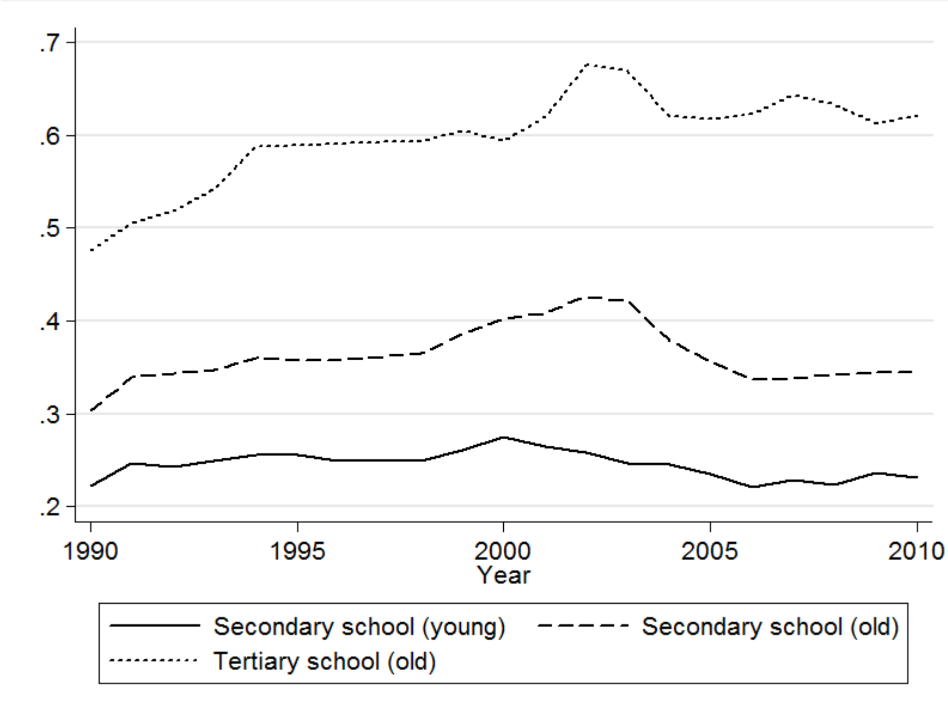
Figure 1. Time of Dropout

Probability of achieving *y* years of education (conditional on not having finished secondary school and not enrolled)



Note: Values computed as the percentage of the population with *y* years of education. Only population with no secondary school and not attending school used. Early 1990s computed for years 1990-1995 and late 2000s for 2005-2010. Rural-Urban and Male-Female identified by data provided in each survey. Income quintiles constructed using primary and secondary activity household winsorized wages. Country Group 1 includes Argentina, Chile, Mexico, Panama, and Uruguay. Country Group 2 includes Colombia, Costa Rica, Ecuador, Peru, Paraguay, and Venezuela. Country Group 3 includes Bolivia, Brazil, Dominican Republic, Guatemala, Honduras, Nicaragua, and El Salvador.

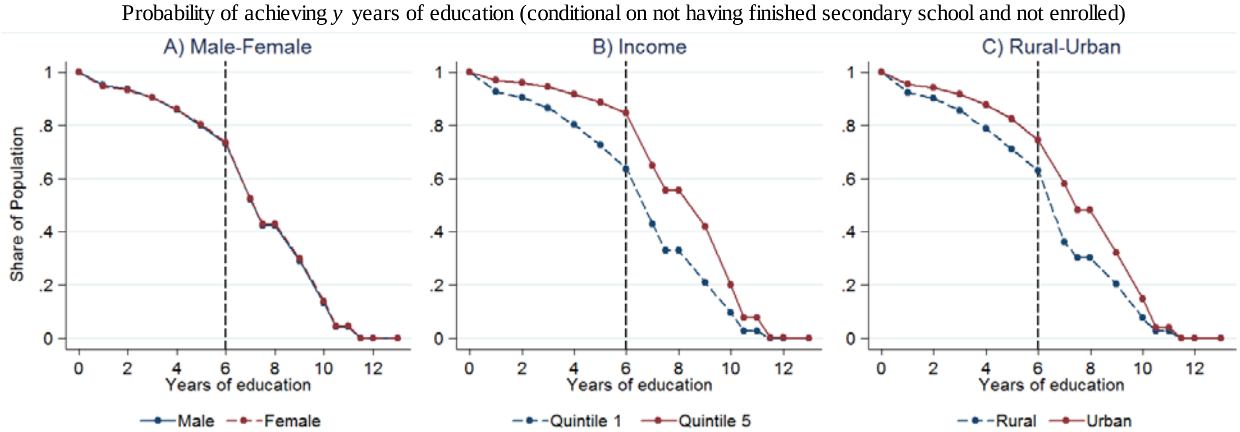
Figure 2. Education Returns in LAC



Note: Young defined as population from (school finishing age+1) to 26 y.o. Old defined as population from 27 y.o. to 55 y.o. Secondary school return for the young group computed in the Mincer equation as the return of finishing secondary school vs. dropping out in secondary adjusting by age. Secondary and tertiary school return in the old group computed as the difference between completing secondary and completing tertiary vs. dropping out in secondary, adjusting by age.

Figure 3. Time of Dropout

Probability of achieving *y* years of education (conditional on not having finished secondary school and not enrolled)



Note: Values computed as the percentage of the population with *y* years of education. Only population with no secondary school and not attending school used. Early 1990s computed for years 1990-1995 and late 2000s for 2005-2010. Rural-Urban and Male-Female identified by data provided in each survey. Income quintiles constructed using the primary and secondary activity household winsorized wages. Country Group 1 includes Argentina, Chile, Mexico, Panama, and Uruguay. Country Group 2 includes Colombia, Costa Rica, Ecuador, Peru, Paraguay, and Venezuela. Country Group 3 includes Bolivia, Brazil, Dominican Republic, Guatemala, Honduras, Nicaragua, and El Salvador.