CHAPTER 9

Breaking the Cycle of Underinvestment in Human Capital in Latin America

Human capital is essential for enhancing the productivity of the Latin American poor and accelerating growth and poverty reduction. Why are the Latin American poor not accumulating enough human capital? What main policies can ensure they get the minimum level of skills required to break the cycle of poverty and low human capital? This chapter finds that an educational divide keeps the poorly educated in persistent poverty. That divide is caused by a combination of liquidity constraints and lumpy and uneven returns to schooling.

HUMAN CAPITAL, IN ITS BROADEST sense, encompasses the levels of education, health, and nutrition of the population. Despite some uncertainty surrounding the results from cross-country empirical studies, human capital (proxied by education or health levels) is generally considered one of the key determinants of growth. In a previous report in this series, for example, de Ferranti and others (2003) described how educational investments are crucial for increased productivity, rapid technological adaptation, and innovation, all essential for sustained growth. Chapter 8 illustrated how sufficient levels of education are critical if poor Latin American families are to benefit fully from growth opportunities and to reduce earnings inequality in the longer term. Chapter 7 pointed to cross-country empirical evidence showing that poverty may affect education levels, thus opening the possibility of a two-way causality in this relationship.

This chapter investigates the mechanisms that could support this double causality and their bearing on the disappointing level of skills upgrading and persistent poverty of the region. In particular, it aims to improve the understanding of the main barriers to and opportunities for significantly boosting the pace of educational progress and poverty reduction in Latin America and the Caribbean.

The chapter begins with a well-known fact: families with less than secondary schooling tend to be poor, and they tend not to invest enough in education for their children to escape poverty. Several questions then become central: Is this situation perpetuating across generations? Can market forces be expected to break down this poverty–low-education cycle, say, with sustained economic growth? Or are there self-reinforcing mechanisms that tend to reproduce the cycle? If so, what are they, and what sorts of public policy interventions are needed to address them?

- The chapter shows that Latin America is divided between individuals who are highly educated and those who have little education, and this divide is simultaneously a source and a result of subsistence incomes across generations. Since parental education and income are strongly correlated with children's educational attainment, the educational divide is also

This chapter is based on background analyses for this report by O. Arias, A. M. Diaz, and V. Fazio.

self-reinforcing across generations. The dominant mechanism in most countries is a function of a vic ious investment dynamic: returns to schooling are low when it is cheaper to invest and become attractive when the costs of schooling are hard to afford.

We corroborate these findings in ten countries, showing that:

- Returns to schooling are essentially flat when students are in primary and secondary school and increase only with and after completion of secondary education. This pattern is consistent with a skill bias in labor demand from technological change in the region (de Ferranti and others 2003).
- Opportunity costs (forgone family income from children's potential earnings) and direct costs are larger for poor families with children in their final high school years and at the tertiary level, thus making liquidity constraints more binding.
- In some cases the full return to educational investments materializes only around completion of secondary or tertiary education.
- In most countries, poor families face below-average returns to tertiary (and sometimes secondary) education, perhaps because of disadvantages in family factors needed for skills development at home (such as family background or attitudes toward schooling) and lack of access to quality schools or high-pay jobs.

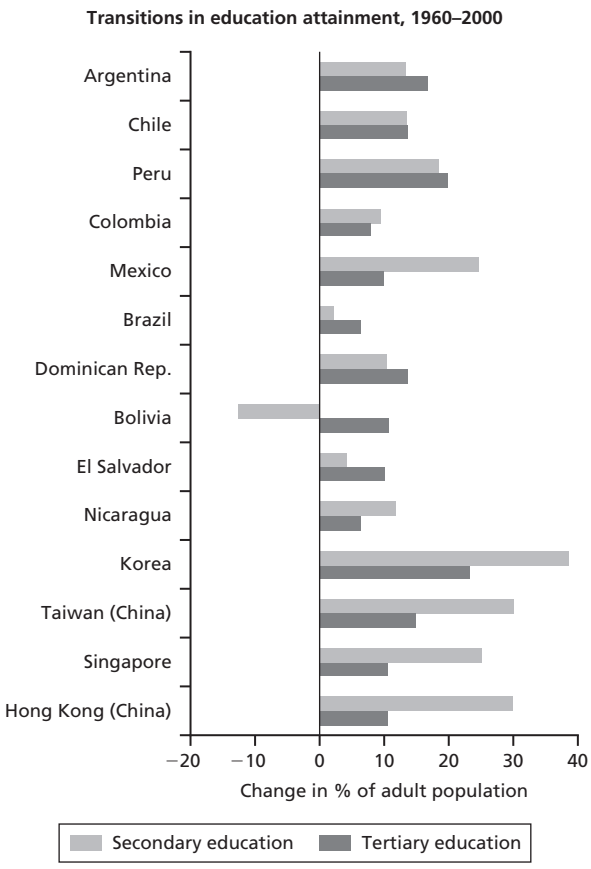
These findings suggest that the value options of a secondary or university diploma alone cannot be expected to break Latin America's educational divide. Poor families have to juggle current subsistence needs against investments in schooling that carry a remote and uncertain payoff. The end result: they invest in climbing the educational ladder while it is cheap, but stop when it becomes more costly and when the full return to the investment cannot be realized because of the children's poor academic performance or the inability to buy higher-quality education. Of course, families are guided by other strong nonmonetary considerations when investing in their children's education. But the harsh economic reality of poverty too often becomes preponderant.

Comprehensive policies are needed to break the vicious cycle of poverty and low educational attainment in the region. These policies must move beyond typical narrow educational policies to encompass integrated strategies for developing long-term skills that correct deficiencies in early-childhood development of poor children, strengthen grade transitions and degree completion, upgrade education quality for the poor, and improve the operation of labor markets.

The educational transition in the region: Slow and unbalanced progress

As a starting point, we illustrate two relevant findings of the 2003 flagship report on education and technology (de Ferranti and others 2003). First, skills upgrading through formal education, the so-called educational transition, has been much slower in Latin America and the Caribbean than in East Asia, although both regions started with similar educational attainment in 1960 (figure 9.1). Second, the transition in most Latin American countries has followed a

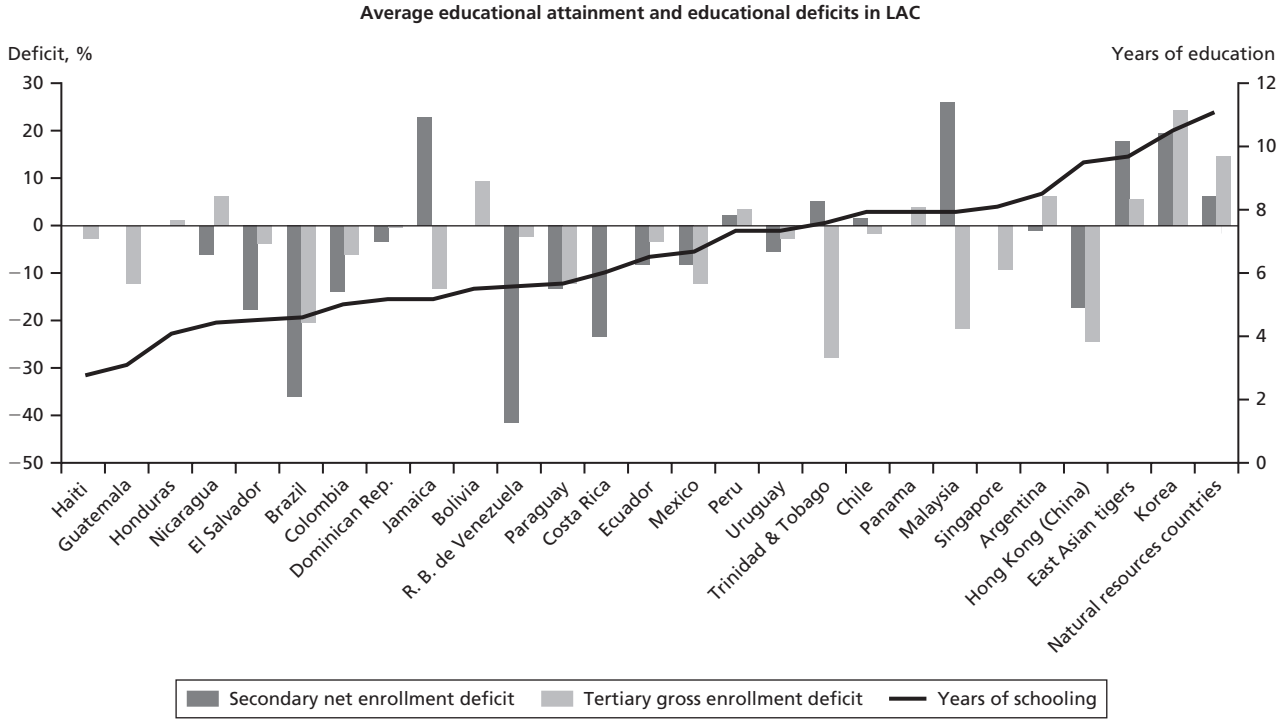
FIGURE 9.1
Latin America is in a slow educational transition



Source: Based on de Ferranti et al. (2003).

FIGURE 9.2

Most Latin American countries show deficits in secondary and tertiary enrollments



Source: Based on de Ferranti et al. (2003).
Note: Deficit is defined by the gap between a country's actual educational attainment and what is expected from its per capita income. Data are circa 2000.

pyramid distribution, with smaller numbers of people with secondary education than with primary education. In contrast, East Asia moved to a distribution with higher numbers of secondary-educated workers than of those with primary or tertiary education. Some Latin American countries, such as the Dominican Republic and El Salvador, even funded tertiary schools at the expense of secondary schools and so developed an even larger "missing middle" of secondary education. As a result, most of the region has significant deficits in secondary and tertiary schooling (figure 9.2) and a lower accumulation of average years of education, a first-pass measure of skills.

The 2003 flagship report and the recent regional companion to the *World Development Report: Making Services Work for the Poor* (World Bank 2004d) analyzed institutional factors affecting educational markets and the provision of education in the region. In this chapter we focus on the specific links between education and poverty and its intergenerational transmission.

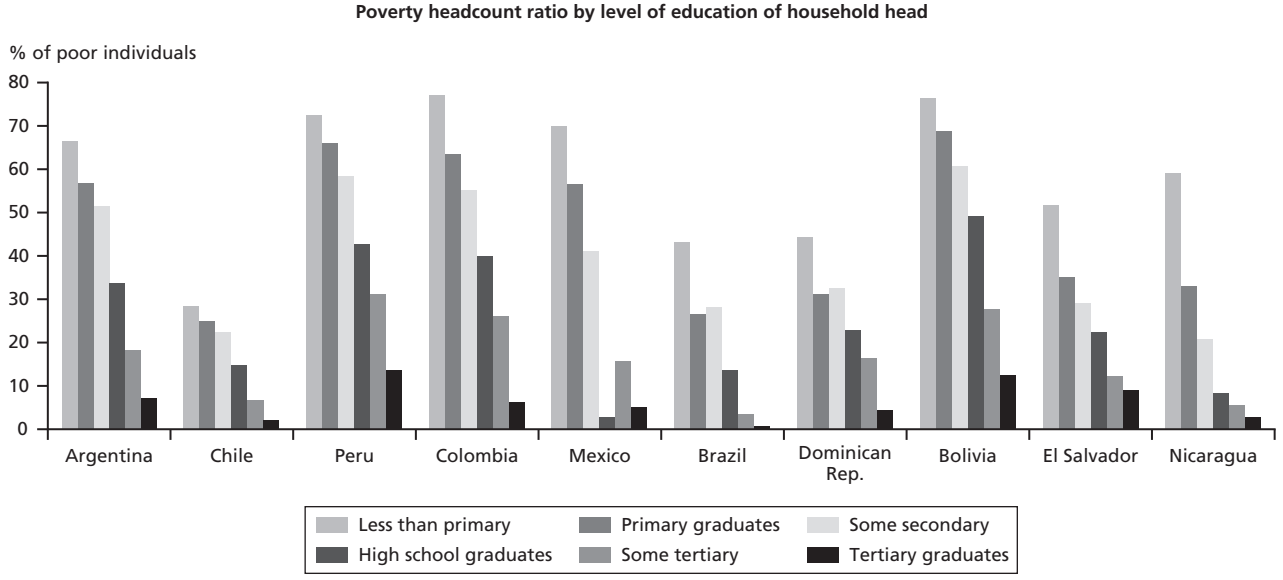
Poverty and human capital: A two-way relationship

Poverty can be related to the accumulation of human capital as both cause and effect. That higher educational attainment during youth leads to higher incomes later in life is probably the most documented finding in empirical microeconomics.[1] At the same time, poverty leads to lower human capital formation through various mechanisms discussed below. Figures 9.3 and 9.4 illustrate the two-way relationship between poverty and schooling for our sample of Latin American and Caribbean countries, ranked by their overall educational development (see annex 9A).

Figure 9.3 shows that in all countries the fraction of poor individuals falls systematically as the education level of the head of family rises.[2] In fact, a typical family head requires at least a high school diploma to make a significant dent in poverty. Poverty rates are 25 to 40 percentage points lower among families headed by high school graduates compared with those whose head has not completed

FIGURE 9.3

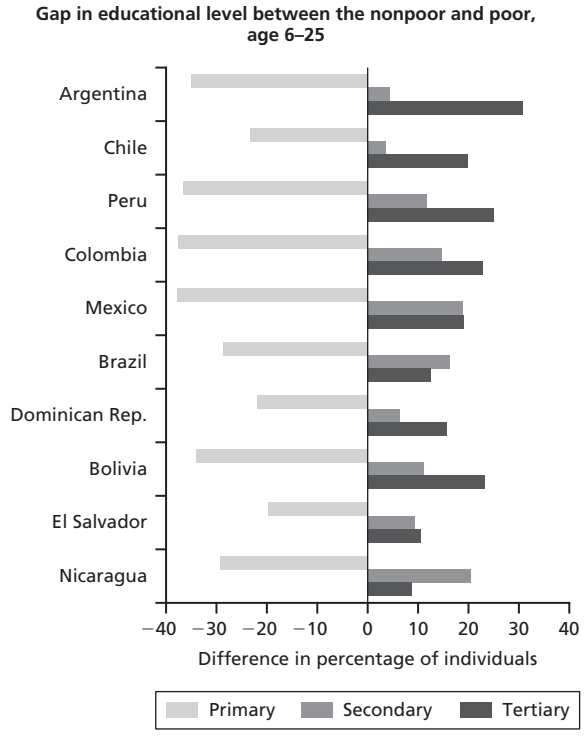
Poverty is higher in families in which the parents have little education



Source: Based on data from SEDLAC.

FIGURE 9.4

Children and youth in poor families have low educational attainment



Source: Based on data from SEDLAC.

primary education. Only a college education secures an income level that makes ends meet: in almost all countries less than 10 percent of individuals are in poverty when the family is headed by a college graduate. Income poverty regressions in numerous World Bank country poverty assessments corroborate that households with main earners (heads and spouses) who have secondary education and above are typically two to three times less likely to be poor.[3]

Figure 9.4 illustrates the reversed stream of the cycle: poor families invest much less in human capital of their offspring. A much lower proportion of Latin American children and youth from poor families reach secondary and tertiary education than do children of richer families. The fraction with only primary education is 20 to 30 points higher among the poor; the college education gap reaches 20 percentage points or more among countries like Argentina, Bolivia, Chile, Colombia, and Peru. The achievement gap between the poor and nonpoor is much smaller at the secondary level, although it still ranges from 15 to 20 percentage points in Brazil, Mexico, and Nicaragua. The relatively more egalitarian distribution of high school students reflects the already noted failure to expand secondary education massively in the region.

Thus, the acceleration of educational development in the region requires filling in the missing middle of the educational pyramid through a more egalitarian skills upgrading. History indicates that under current national progression rates, it may take two to four decades to erase the schooling gaps between the poor and nonpoor in these countries.[4] Several self-reinforcing mechanisms could prevent this catch-up from happening and lead to persistent underinvestment or a slowing down in human capital formation and to poverty traps. These are discussed below.

Human capital formation: Sources of underinvestment traps

Human capital formation is a synergistic process that starts very early in life. A large body of literature documents the importance of adequate health and nutrition for developing cognitive capacity, readiness to learn at school, and greater productivity in adult life.[5] With the acquisition of formal schooling and training from childhood to adulthood, these early investments crystallize in the development of marketable skills (Heckman 1997, 2000). The number of years of education are therefore only a first-pass measure of the skills embodied in individuals. The productivity content of an individual's educational level depends on the quality of family and school formation during infancy, childhood, and adolescent years.

The determinants of human capital investments are captured in the well-known Becker (1967, 1975) model of human capital and household behavior. Parents make schooling decisions for their children to maximize the welfare of all household members by allocating family resources (including time in the home) among consumption, work, schooling, and leisure. Education is an investment with associated costs made in exchange for future benefits, that is, on the basis of net expected returns. The costs include direct outlays such as school fees and other related expenditures and the indirect opportunity cost of time (including forgone earnings from work), as well as any nonmonetary costs related to aptitude and readiness to learn. Private benefits from higher levels of education are generally future higher earnings in the labor market but also include increased capabilities to function in a modern society.

The costs and benefits of schooling are influenced by supply and demand factors related to household characteristics, public investments, and the functioning of labor and education markets. Among chief supply factors, low accessibility of schools offering required grades and deficiencies in the educational system can limit the school progression of children and youth. On the demand side, family income or wealth, parental education, the number of offspring, and unequal access to higher-paying jobs can affect access to higher-quality schools, attitudes and family time devoted to schooling, and ultimately child scholastic performance and the returns to schooling. The poverty-traps literature points to several self-reinforcing mechanisms that can lead to sluggish school transitions coupled with persistent poverty in entire economies or certain population groups (Azariadis and Stachurski 2005; Bowles, Durlauf, and Hoff 2004; and Mayer-Foulkes 2004). These mechanisms and their empirical implications are described below.

Credit constraints and increasing, lumpy returns: Too poor to afford schooling

The inability to afford education is the most recognized inhibitor of human capital formation. Credit restrictions and indivisibilities in human capital investments can lead to self-sustaining underinvestment and poverty traps even if the returns to education are high (Galor and Zeira 1993; Ljungqvist 1993). This can happen especially when families must invest in their children's schooling for a span of many years before education becomes a profitable endeavor.

Educational investments are the prime example where adverse selection, moral hazard, and the lack of acceptable collateral can lead to suboptimal investment by the poor. Several studies show that the main cost factor making schooling investments unattractive to very poor families is the opportunity cost of the children and young people who can work at home or receive pay in the labor market (Basu 1999; Strauss and Thomas 1995). This situation is aggravated in families with many small children (Behrman, Pollak, and Taubman 1989; Haveman and Wolfe 1995) and in rural or periurban areas with remote public schools and a deficient basic infrastructure. Direct costs, such as school fees, become relatively more binding on poor families at the postsecondary level. Liquidity constraints and the inability to borrow against future higher earnings lead to underinvestment.

Moreover, many poor families may underinvest in schooling because the full benefits of the investment are too remote. The probability of getting to the tertiary level is lower for children of poor families, so they may face both a lower expected return and more uncertainty in realizing

income gains from schooling. This can happen when the returns to education increase markedly with the level of education, as has been widely documented in Latin America (de Ferranti and others 2003; IDB 2004; Bourguignon, Ferreira, and Lustig 2005). There also may be a diploma, or "sheepskin" effects, whereby much of the schooling earnings premium accrues to those who have completed a high school or hold a university degree.[6] In this case the option value of completing secondary school and going to the university is the main incentive to attend school in the first place. For a poor family the rate of return to education may compensate for the cost of delaying present consumption (their discount rate) only when children can complete a minimum level of education (such as primary or secondary school). Hence, poor children are more likely to drop out of school once or before they reach education levels where liquidity constraints become more binding, as is the case in the transition from secondary to university education. We next discuss some mechanisms that may lower the returns to schooling for the poor.

Intergenerational and agglomeration effects: Too poor to benefit from more schooling

Multiple failures in the skills development process can inhibit the development of the scholastic and labor market abilities of poor children and youth and thus lower both their educational attainment and returns to schooling. Human capital formation is a long-term process subject to important intergenerational and agglomeration externalities. Families and community environments have a key role to play in the early development of cognitive and noncognitive skills critical to the schooling process. Failures in developing these skills either at home or in the first grades of school accumulate and hinder a child's readiness to learn. The quality of schools is, of course, central to developing basic cognitive and problem-solving skills that complement education and readily translate into higher productivity in the labor market. These multiple skills crystallize in an individual's "scholastic ability" (readiness to learn at school) and "labor market ability" (capacity for on-the-job acquisition of skills).

While scholastic and labor market abilities are correlated, they can lead to different schooling and labor market outcomes. Scholastic abilities are reflected in academic scores and lead to higher educational attainment (including its quality content), while labor market abilities refer to the skills needed to learn and adapt to different tasks and problem-solving environments. The lay terms for these abilities are "book smarts" and "street smarts." In the labor market these abilities result in higher returns to whatever level of education an individual acquires.[7]

Children born into disadvantaged families are at higher risk of experiencing malnutrition, illnesses, and home environments less conducive to learning, and they tend to receive a lower quality of schooling. They therefore tend to develop less motivation and readiness to learn, as well as to have lower levels of the noncognitive skills complementary to education. It is difficult to remedy fully the impact that these deficiencies in a child's early years can have on the development of skills during youth and adulthood through formal schooling or training.[8] Poor children therefore can face important long-term learning constraints even in the absence of short-term liquidity constraints to attending school. These deficiencies can lead to more grade repetition, delayed progression, lower expected returns to schooling as adults, and ultimately little transition to higher education grades.

Social exclusion caused by overt discrimination or biases in public investment allocations can prevent poor families from taking advantage of human capital production externalities (such as spatial or labor market spillovers). Residential segregation can lead to dismal funding for schools in poor communities and to negative sociological factors such as the absence of role models and externalities for learning ("peer group" effects), trapping children of poor families in low levels of education.[9] Lack of labor market connections or discrimination may hinder their access to the higher-paying jobs available for their level of schooling. Although discriminatory practices can hurt the efficiency of profit-maximizing firms, there is evidence that the effects of exclusion on human capital formation and socioeconomic status can persist for generations, impervious to competitive market pressures (Borjas 1992; Heckman 1997).

There are also externalities in human capital formation related to interdependencies between private investments in skill and broader capital formation, particularly skills agglomeration and technological innovation. Countries or regions lacking a minimum skill level (typically workers with some secondary schooling) are less likely to attract more technology and domestic or foreign investments in

technology and areas that require research and development (R&D) skills.[10] Lack of technology investments holds back the growth in the demand for skills and thus the ability to maintain attractive private returns to higher levels of education under a massive educational expansion. The ensuing slowing down in the transitions to higher educational grades in turn continues to hinder technology upgrading and reinforces the low-skill, low-innovation cycle.

The upshot of all the mechanisms described here is to alter the poor's expectations of the likely returns to long-term schooling investments. Even if average returns to education are high, at any education level, there may be considerable variation in returns to schooling for new entrants to the labor market. While the evidence points to a pro-cyclical relationship between macroeconomic crises and educational enrollment in the region (since the lowering of opportunity costs dominates liquidity constraints), less is known about the impact of the region's ever-present volatility on long-term investments in secondary and college attendance.[11] This and other sources of uncertainty in returns can trap the poor in suboptimal education levels despite decisive public efforts to expand their access to schooling by removing infrastructure and credit constraints.

Identifying human capital underinvestment traps: In search of the smoking guns

How can we examine the empirical relevance of these mechanisms for explaining the slow educational transitions of many Latin American countries? The data requirements for conducting proper empirical tests of the relevant hypotheses are prohibitive—namely, a long panel data set covering a representative sample of families, including clean indicators of nutrition, health, and cognitive and noncognitive abilities of children and adults, along with standard socioeconomic characteristics. In a recent detailed study for Mexico, Mayer-Foulkes (2004) relied on evidence from a specialized health household survey and income and expenditure cross-section surveys to examine mechanisms generating human development traps. Building on his analysis, we uncover the supporting evidence for the following empirical regularities in the ten countries we are focusing upon:

- A multipeaked education distribution (grade clustering) that shows a persistent divide between those with low levels of education and those with high levels. The evidence also shows persistent delayed transitions to higher grades, closely related to family income and exclusion.
- Increasing and heterogeneous returns to education. Particularly notable are returns that become significantly more attractive at higher levels of education; show significant spikes for graduation grades (sheepskin effects); and are lower for individuals from poor, lower-ability, and disadvantaged families and regions.
- Strong intergenerational effects in human capital formation, chiefly, strong effects of liquidity constraints (such as low family income and high family size) and long-term family-limiting factors (such as low parental education and family effects on education returns) on the educational progression of children and youth.

In examining these hypotheses, we rely on recent living conditions household surveys to estimate for each country a full set of Mincerian returns to education. These measure variation across education levels and workers' observed and unobserved characteristics (see annex 9A). They also track microdeterminants of grade progression for individuals in the 6–25 age range, with a focus on the effect of family factors on grade-to-grade transition probabilities while accounting for the sequential nature of schooling investment decisions (see annex 9A).

Evidence supporting a combination of these elements would make a stronger case for the existence of human capital underinvestment traps. For example, underinvestment traps are more likely at play when educational attainment is low despite high returns to schooling (at all levels of education and for all workers) and when liquidity constraints affect progression to higher education grades. Poverty traps may also arise when the low- and high-education divide occurs at a level of education insufficient to make ends meet. For each country we take a hard look at the evidence to draw conclusions about the quantitative importance of the underlying mechanisms.

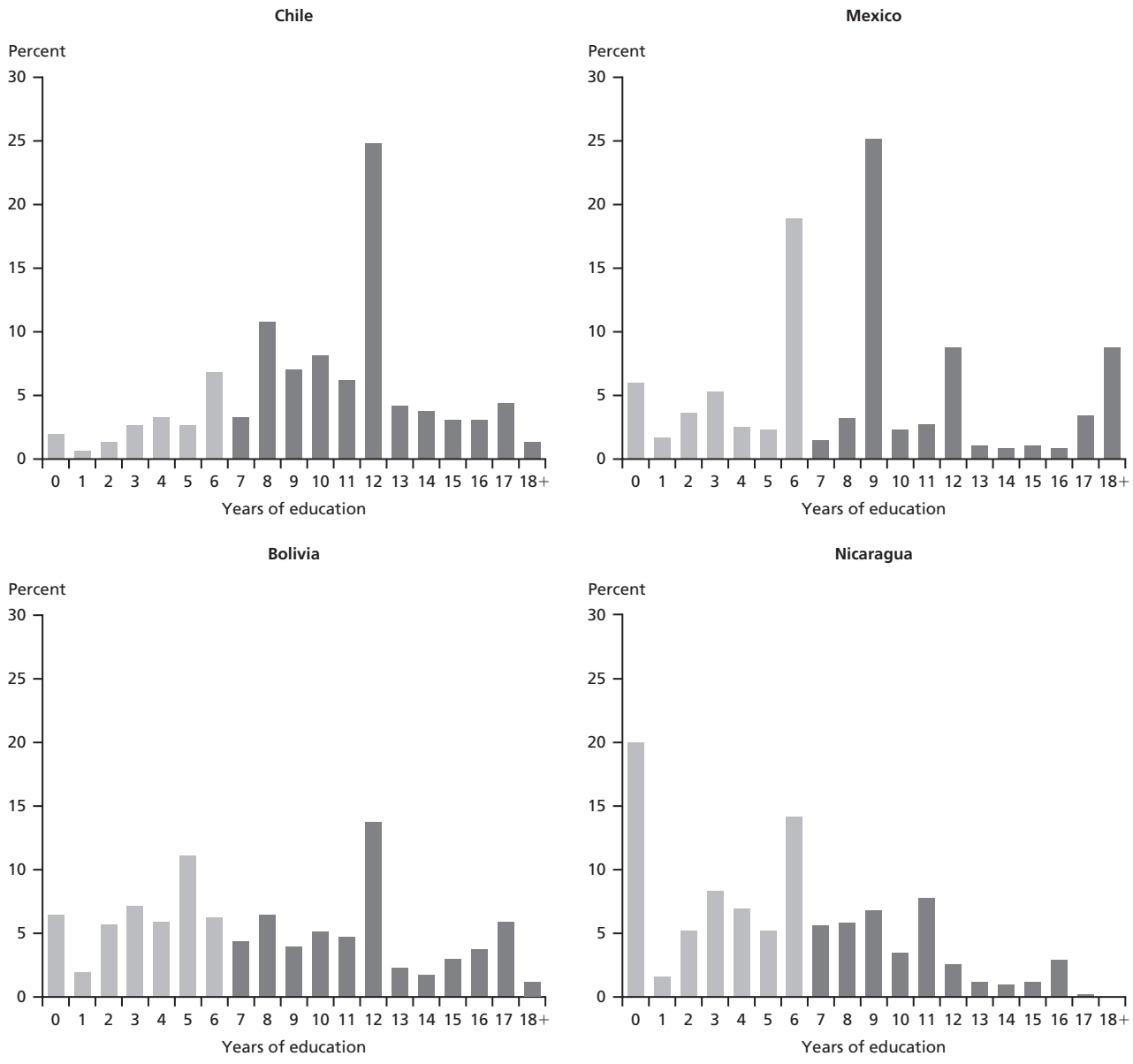
The educational ladder in Latin America: A persisting educational divide

Educational transitions can be thought of as climbing a ladder, where at each step, or grade, individuals and their families decide whether to move up to the next step. If

educational attainment were determined solely by an individual's liking for schooling, the percentage of people at each step would not vary significantly by income or other demographics. Figures 9.5, 9.6, and 9.7 show the distributions of the educational attainment of the working-age population (ages 15–65) across income groups, location, and cohorts for four countries chosen to represent the variety of observed educational progressions. These depict the percentage of individuals at each step of the educational ladder.[12]

Figure 9.5 starts with the national distributions for Bolivia, Chile, Mexico, and Nicaragua. These help visualize the overall clustering of individuals around specific grades (taller bars) and also offer grand summaries of the

FIGURE 9.5
Educational attainment of working age population, by country



Source: Authors' estimates based on household survey data.

skills-matching possibilities faced by firms. Two different grade clusters stand out in Chile (those completing basic education and high school graduates) and Mexico (those with complete primary and those reaching up to lower secondary). A third, much smaller cluster in these countries is apparent for those completing tertiary schooling and beyond. The distribution of skills is more diluted in Bolivia and Nicaragua (with peaks centered at very low grades), a sign of failures in completing diploma-granting grades and of delayed grade transitions (overage students). The grade clustering in Argentina, Brazil, and Colombia mimics that in Mexico, with one of the peaks at secondary completion and with higher dispersion in Argentina and Brazil. Peru closely resembles the Chilean grade distribution, but with a higher density of university graduates; while the Dominican Republic and El Salvador mimic the grade distribution in Bolivia and Nicaragua. It would be harder for firms in the latter four countries to match workers to more technology-intensive investments.

The clustering of educational achievement crystallizes in an educational divide of the population strongly related to income class and area of residence. Figure 9.6 presents the educational distributions for the poorest 30 percent and the richest 30 percent in the representative cases of Argentina, Brazil, El Salvador, and Mexico. The two educational grade groupings noted for Chile and the modest clustering in tertiary education are strongly reinforced across income classes in Argentina as well as in Mexico, except that completion of lower secondary education is not an income-schooling divide for Mexicans. High school completion is the sharp dividing line between the poorest and richest in Brazil, while few of the very poor working-age Salvadorans have finished primary education. The income–school grade groupings in Chile, Colombia, and Peru are similar to Brazil's, although with varying degrees and more visible college graduate clusters. Nicaragua and, to a lesser degree, Bolivia and the Dominican Republic mimic El Salvador's groupings. The richest Latin Americans do not stand out as university-goers. The best performers are in Argentina, Colombia, and Mexico, where around one-third of individuals from the richest families obtain a university degree, compared with more than half of all adults in the United States and Canada.

The slicing of educational groupings for urban and rural workforces is even more startling (figure 9.7). In Brazil, Bolivia, El Salvador, and Nicaragua, the bulk of the rural workforce has not gone beyond primary education, and roughly 20 to 30 percent of workers have no schooling. Barely 15 percent reach lower high school in Mexico, and only about 10 percent finish a full course of secondary school in Chile, Colombia, and Peru.[13] Hence, poor rural families unable to migrate to urban centers can hardly count on education as a means of mobility to better jobs.

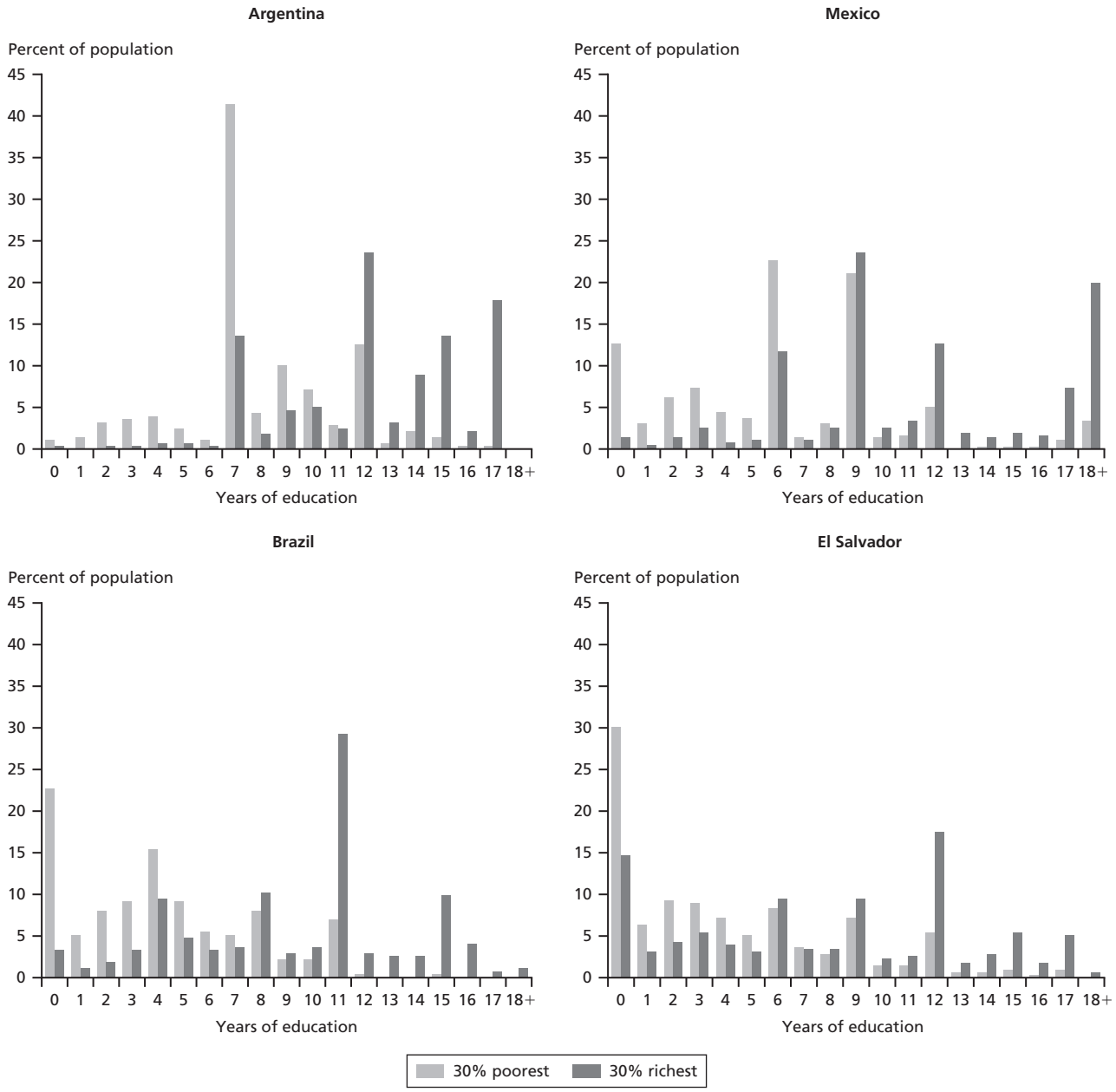
Except for the more educationally developed countries, the educational divide of the population seems to be sustained over time, with prolonged and unequal educational transitions still the norm among younger individuals. Figure 9.8 illustrates the typology of education transitions for three birth cohorts (ages 15–25, 26–40, and 41–65) that attended school during the last 60 years (each spanning roughly two decades) in Argentina, Colombia, El Salvador, and Mexico.[14] Despite steady progress in educational attainment, clustering at grades below secondary completion is still prominent in many countries.

In the less educationally developed countries, progress in educational attainment is not yet strongly visible in the younger labor force, and attainment of higher grades remains sparse. For example, 20 percent of the young Salvadoran workforce still has no schooling whatsoever, only slightly less than older cohorts there. Colombia has a balanced transition with a single peak at secondary completion, while postsecondary education is still rare for the two younger cohorts. That is, they show signs of moving toward a diamond-shaped educational distribution. Chile and Peru show a similar pattern. The schooling ladder in Mexico remains largely twin-peaked for the youngest cohort, with clustering at lower secondary completion becoming more pronounced (30 percent of the youth). Argentina is the only case where the youth appear to be in a balanced educational transition that breaks the postsecondary education barrier and points to an inverted-pyramid-shaped education distribution. However, about 20 percent of prime-age Argentines and 30 percent of the older cohort hold only a basic education degree.

The data for children and youth currently in school indicate that these patterns of educational transitions are being reinforced. Figure 9.9 presents net enrollment rates of individuals in the 6–18 age range for most countries in the region. The demand for schooling, signaled by almost universal enrollment rates, is strong up to age 13, which corresponds to the completion of primary education in most countries. Net enrollment rates begin falling fast beyond this age, with the exception of Argentina, Chile, and Jamaica, where dropout rates accelerate only after the first

FIGURE 9.6

Educational attainment for the poorest 30 percent and the richest 30 percent in Argentina, Mexico, Brazil, and El Salvador



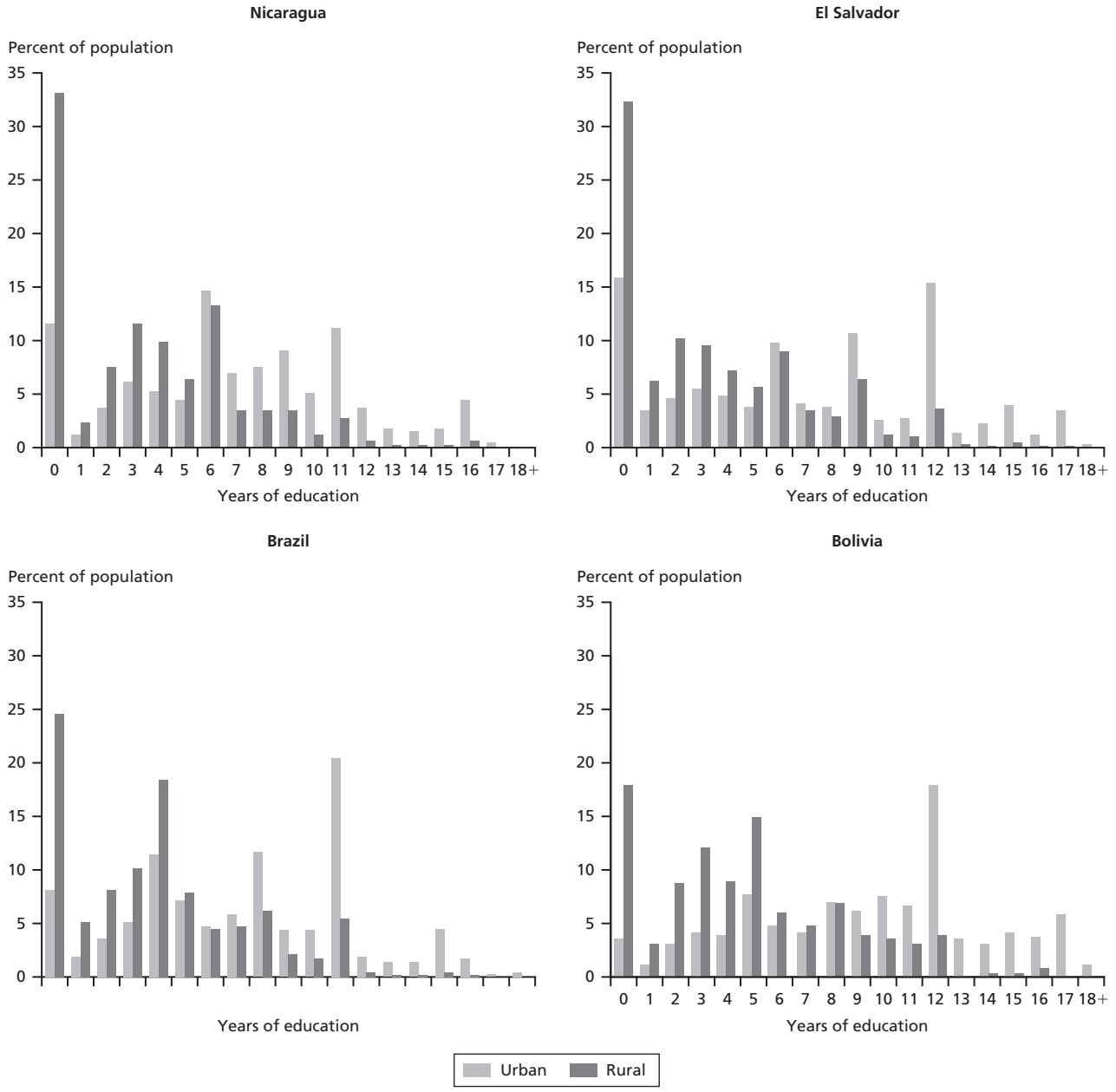
Source: Authors' estimates based on household survey data.

years of high school (15–18 age range). Further analysis of these data in numerous country studies shows that the drop in enrollment rates is generally more marked among children and youth from poor families.[15] The smooth decline in enrollments during the secondary cycle in most countries suggests that lack of secondary school facilities is not the main driving factor.

One common reason for the sharp decline in enrollment is that Latin American children experience delayed transitions mainly due to grade repetition. Figure 9.9 also shows the dismal performance of the region in ensuring high rates of on-time progression to the next grade. This low on-time progression to the next grade, combined with high enrollment, results in substantial numbers of children who

FIGURE 9.7

Educational attainment for urban and rural areas in Nicaragua, El Salvador, Brazil, and Bolivia



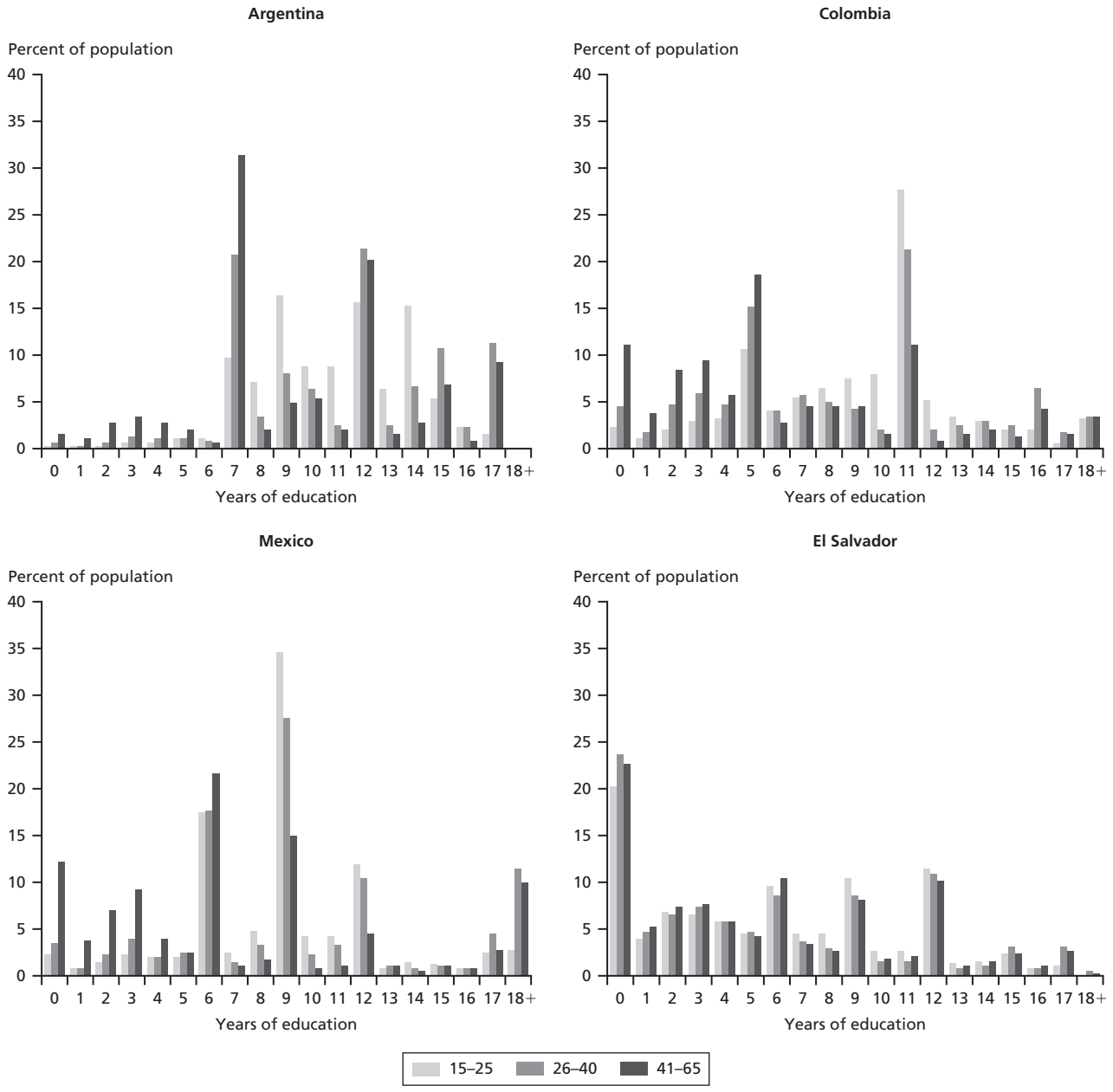
Source: Authors' estimates based on household survey data.

are overage for the grade they are in. For example, in many Central American countries, 40 to 50 percent of children are two or more years overage when they reach secondary education (World Bank 2005b).

Table 9.1 illustrates the poor record of most countries in the region in turning children's and youth's contact with the educational system into years of schooling. For each country it compares a measure of average years spent in school (the "1–12" educational system, 6–18 age range, proposed by Urquiola and Calderón 2004) with the actual number of grades that children have completed, on average. The first column captures the expected number of years that a child will spend in school given the country's current enrollment patterns. It provides a convenient

FIGURE 9.8

Educational attainment for three age groups in Argentina, Colombia, Mexico, and El Salvador



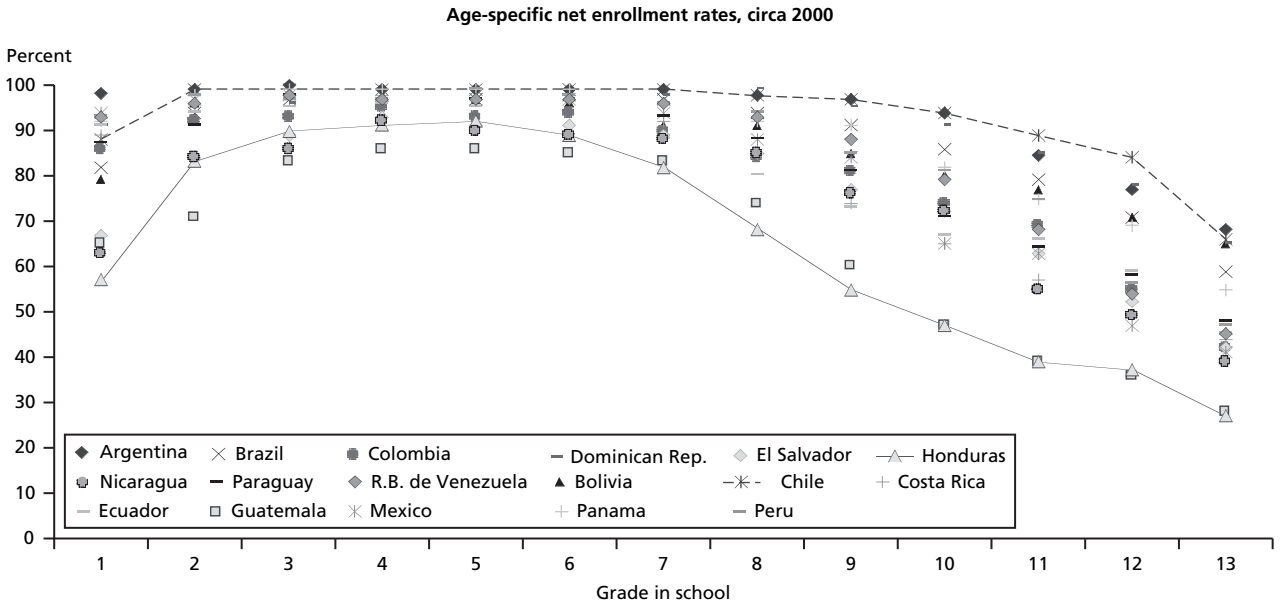
Source: Authors' estimates based on household survey data.

summary of the resources (in a time scale) spent by countries to keep children in school.[16] The gap with respect to the actual grades completed (third column) indicates how effectively educational systems turn average years in school into average number of grades completed.

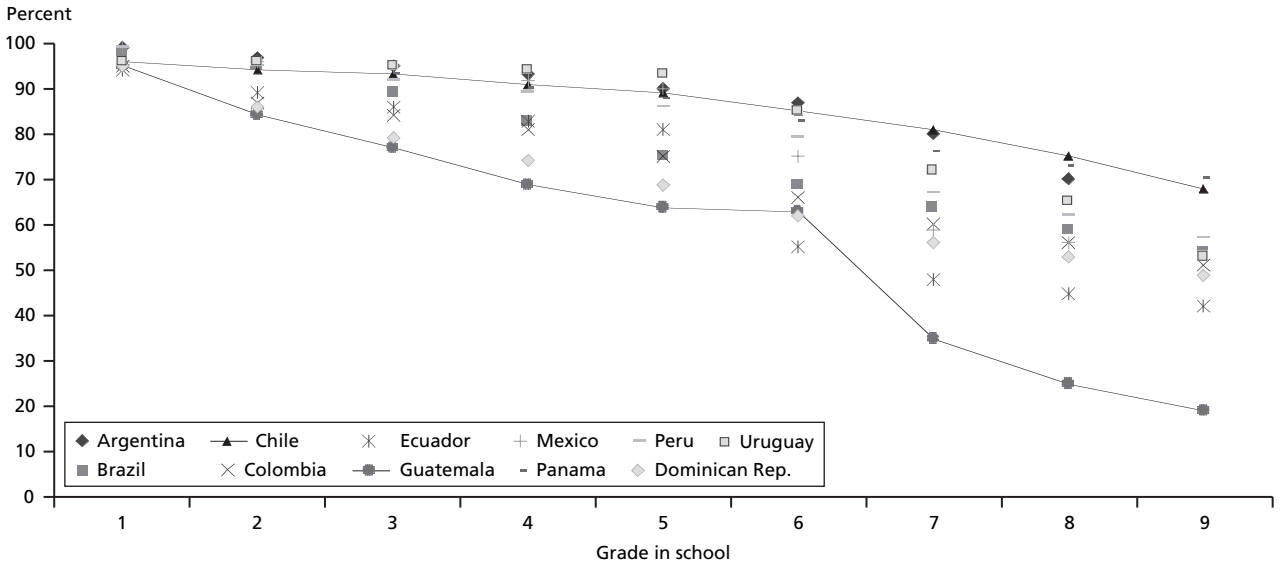
Latin American children stay, on average, two to four extra years in school than needed to complete a full course of secondary education. The countries with lower educational attainment—Belize, Brazil, and Nicaragua, for example—tend to be among the worst performers on this indicator.

FIGURE 9.9

Low educational attainment is reinforced in current cohorts



Source: Based on Urquiola and Calderón (2004).
Note: Data for Argentina include only urban areas.



Source: Based on Cabrol (2002).
Note: Data for Argentina include only urban areas.

However, countries like the Dominican Republic, Jamaica, and Uruguay, which stand out in keeping children in school, are fairly inefficient in the production of years of schooling. This low on-time progression slows down the accumulation of skills, lowers the returns to education (by delaying full entry into the labor market), and likely increases the risk of eventually dropping out.

To summarize, Latin America's success in improving average educational levels, with close to universal primary enrollment, has not been sufficient to reverse the persisting

TABLE 9.1

Average years of schooling in the "1–12" educational system and excess years spent in school, 6–18 age range, circa 2000

Country	Average years spent in school	Average number of grades completed	Average excess years spent in school
Chile	12.1	10.4	1.7
Argentina[a]	12.1	9.8	2.3
Panama	11.5	9.5	2.0
Peru	11.1	9.0	2.1
Bolivia	11.2	8.9	2.3
Jamaica	11.7	8.8	2.9
Ecuador	10.4	8.7	1.7
Mexico	10.6	8.7	1.9
Uruguay[a]	11.4	8.7	2.7
R. B. de Venezuela	11.0	8.6	2.4
Colombia	10.5	8.4	2.1
Paraguay	10.7	8.4	2.3
Dominican Republic	11.8	8.3	3.5
El Salvador	10.0	8.0	2.0
Costa Rica	10.5	7.8	2.7
Brazil	11.4	7.3	4.1
Belize	10.6	6.6	4.0
Honduras	8.6	6.2	2.4
Haiti[a]	8.8	5.9	2.9
Nicaragua	9.7	5.9	3.8
Guatemala	8.2	5.5	2.7

Source: Based on Urquiola and Calderón (2004).
a. Data for urban areas only.

educational divide in the population except in the more educationally advanced countries. Only Chile, Colombia, and Peru show signs of moving fast toward a diamond-shaped educational distribution. Argentina appears to be moving toward this pattern as well, although on a somewhat longer horizon, while Brazil shows delayed but steady progress. The population in the other countries sorts into two groups, one of individuals with low schooling (typically less than secondary education) and the other with more-educated individuals (secondary and above). These patterns of educational attainment emerge strongly across income and regional lines, with rural residents and the poorest families predominantly trapped in the low-education group. Patterns of school progression of current student cohorts indicate that this educational divide repeats itself as a result of high repetition and dropout rates. Since completion of at least a secondary education is needed for typical poor families to have a real chance of escaping subsistence levels, this educational divide might be self-reinforcing and induce persistent poverty across family generations.

Why aren't poor families leading their offspring to a level of education sufficient to better their chances of escaping this potential intergenerational poverty cycle? As noted before, liquidity constraints, deficient infrastructure, and low returns to education may be to blame. These are in turn linked to both short-term (income, for example) and long-term family factors.

Liquidity constraints, family factors, and educational investments: A sneak preview

The reasons Latin American children and youth reveal for being out of school consistently point to a combination of high opportunity costs, perceived low benefits, and access constraints.[17] Figure 9.10 illustrates how the relative emphases on each factor vary by age, gender, and poverty levels in four selected countries. The following patterns emerge:

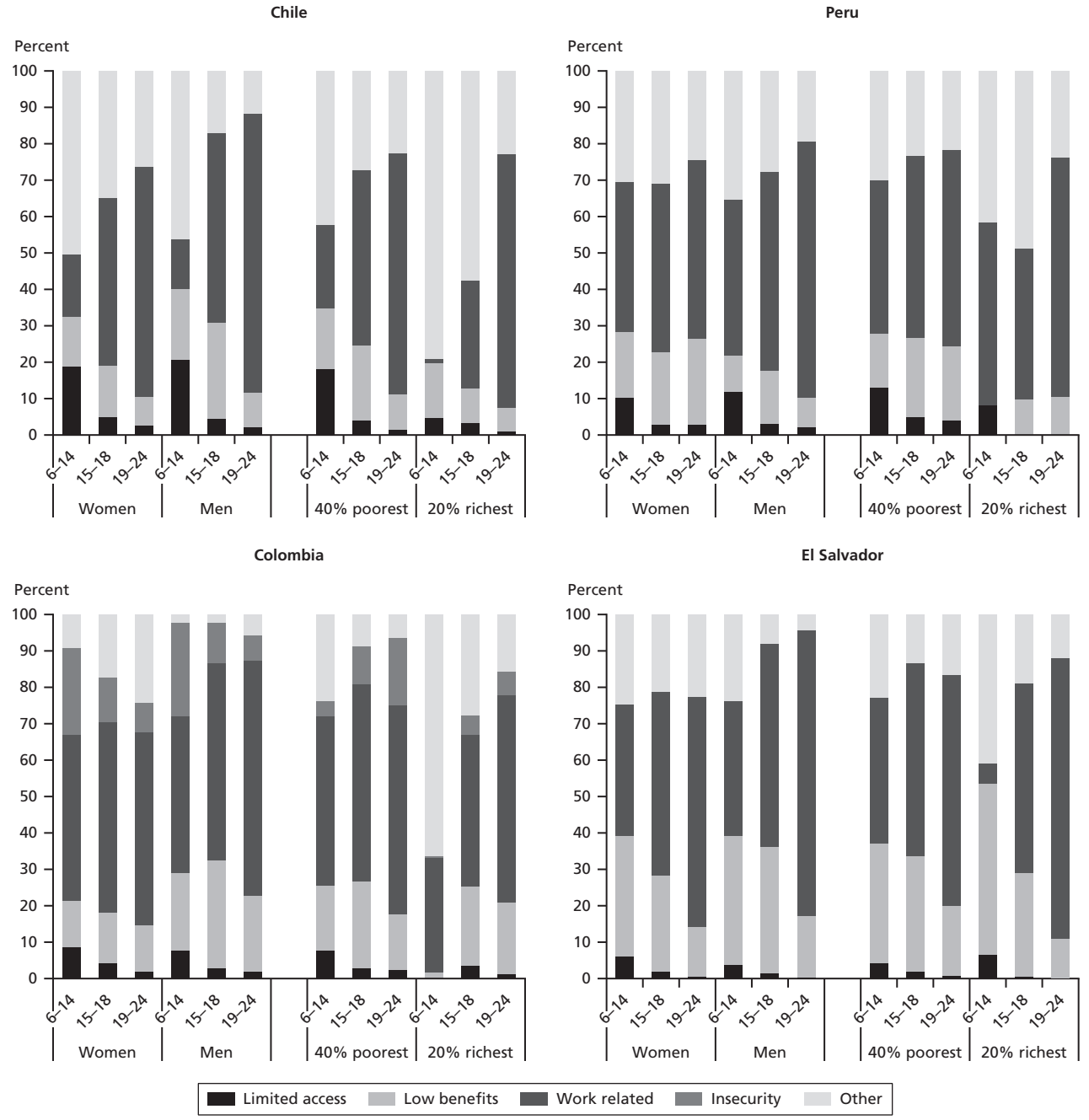
- Work-related reasons (opportunity and direct costs) tend to be the most pressing in all countries, especially among boys, youth of postsecondary school age, and the poor.
- Low benefits are more important among the poor, boys, and children of primary and secondary school age, particularly in Bolivia and El Salvador.
- Other reasons, including pregnancy, family problems, or other idiosyncrasies, are more prevalent among girls, at younger ages, and among the rich, particularly in Chile and Colombia.
- Limited physical access appears to be a less-pressing factor overall, but is evident mostly among primary-school-age children, particularly in Chile, Colombia, the Dominican Republic, and Nicaragua.

Figure 9.11 shows that the relationship between educational investments and proxies of some of the above factors are largely consistent with self-assessments. The cost of schooling appears to be pressing largely for youth of post-secondary school age. The top panel in the figure shows that the opportunity cost, proxied by the contribution of youth's earnings to total family incomes, of sending young children to school is negligible in most countries. While the forgone income increases for adolescents of secondary education age, it still represents less than 10 percent of family incomes.

The greater concern of poor families for present rather than future consumption (that is, a higher discount rate) is very likely to make liquidity constraints binding in the transition from secondary to tertiary school. The income

FIGURE 9.10

Poor children and youth stay out of school because of high costs and low benefits

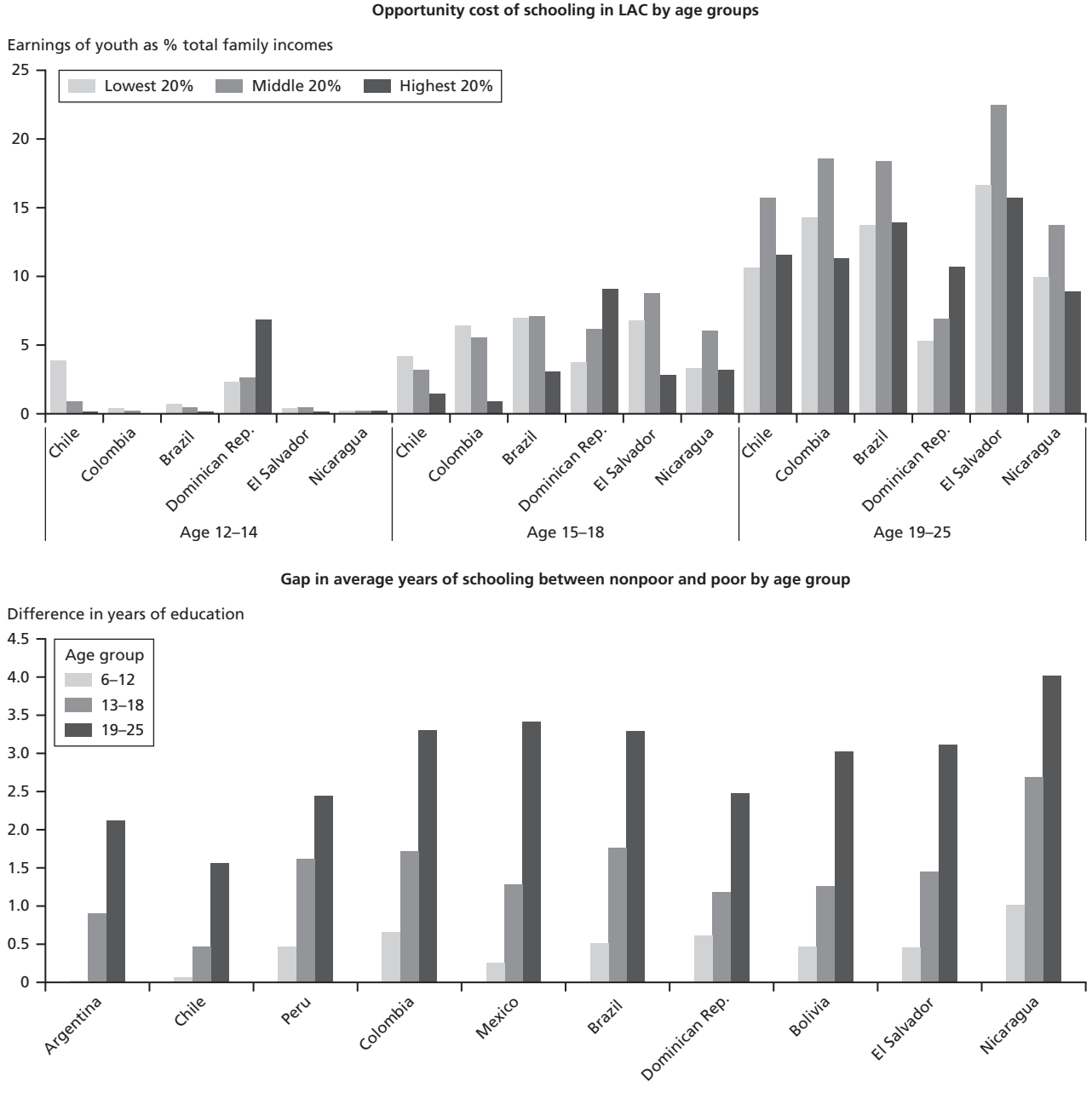


Source: Authors' estimates based on household survey data.

loss for poor families that invest in postsecondary schooling is more significant than for the relatively rich, ranging from 10 to 17 percent for very poor youth and from 14 to 22 percent for the moderately poor (except in the Dominican Republic). The income loss is in addition to the high tuition costs of higher-quality private secondary schools and universities and should be weighted against the promise of high returns to postsecondary schooling.[18] Even for poor youth with access to free public schools, the high dependence of their families on their earnings to make ends meet almost

FIGURE 9.11

Opportunity costs and schooling gaps get larger for secondary to post-secondary school-age children



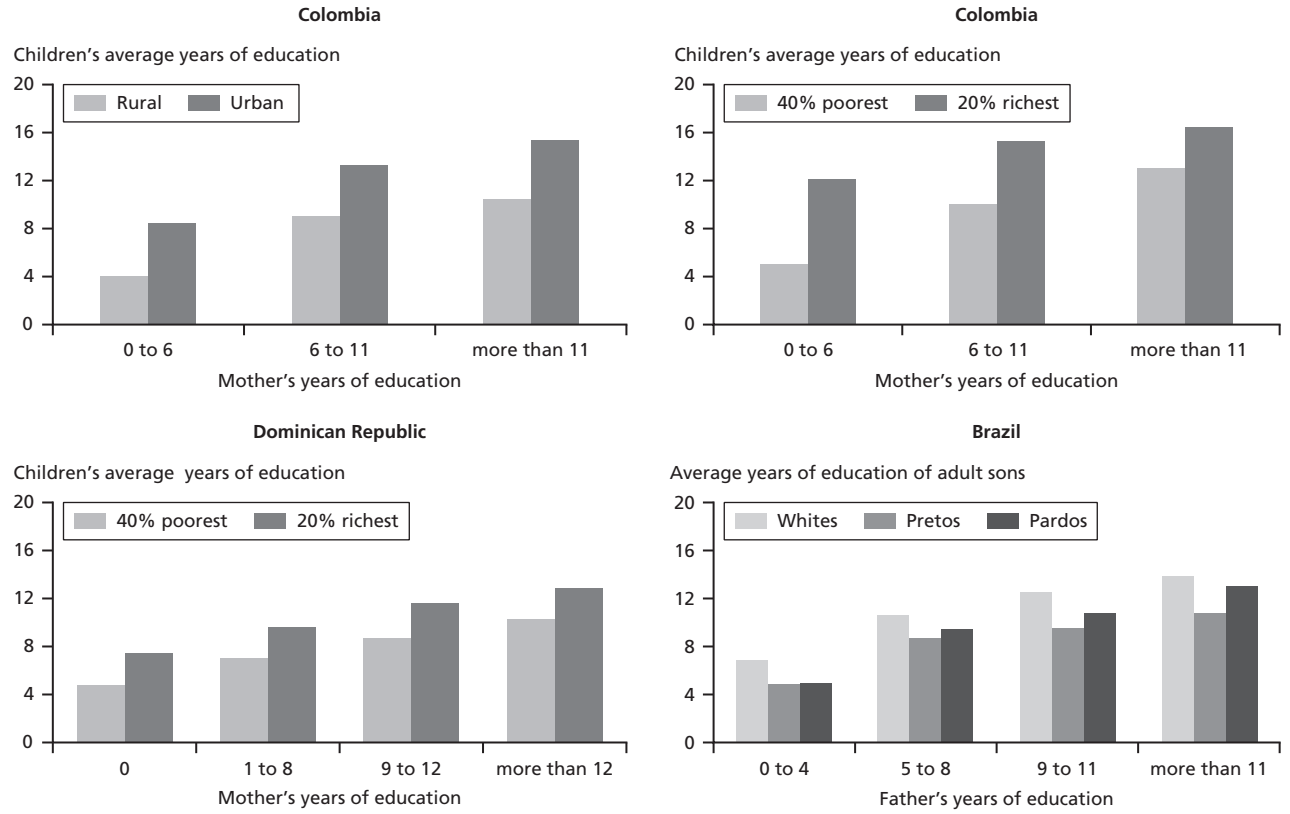
Source: Authors' estimates based on household survey data.

certainly deters transitions to higher education grades. No wonder poor Latin American children start to fall significantly behind the nonpoor in average years of schooling in their teenage and young adult years (bottom panel).

Finally, as noted in chapter 2, well-educated parents tend to have better-educated children. Figure 9.12 portrays this for Brazil, Colombia, and the Dominican Republic, illustrating the strong correlation between parental education and educational attainment and how this is mediated by income levels, school access (proxied by area), and race. Parental education compensates for low incomes and lack of access in Colombia and the Dominican Republic. In Brazil,

FIGURE 9.12

Low education continues for generations, especially among the poor



Source: Authors' estimates based on household survey data. The graph for Brazil is taken from Arias, Yamada, and Tejerina (2004).

pretos (blacks) are caught in an intergenerational low-education trap. Differences in returns to schooling may be behind this unequal educational mobility. We turn to these differences next.

The private value of schooling: How much does it pay? To whom?

The numerous studies estimating returns to education in Latin America and the Caribbean point to several stylized facts:

- Overall, average returns are relatively high compared with other regions of the world, but there is significant variation in returns across countries in the region (Psacharopoulos and Patrinos 2004).
- Education contributes significantly to rising earnings inequality: the average return to tertiary education rose, while returns to those completing secondary and primary education remained sluggish or declined over the 1990s in most countries (de Ferranti and others 2003, 2004; IDB 2004; Bourguignon, Ferreira, and Lustig 2005).
- The trends in returns to schooling are largely attributed, although not indisputably, to relative demand shifts—caused by trade liberalization and parallel technical change—that favor more skilled workers (Bourguignon, Ferreira, and Lustig 2005; de Ferranti and others 2003, 2004; IDB 2004).

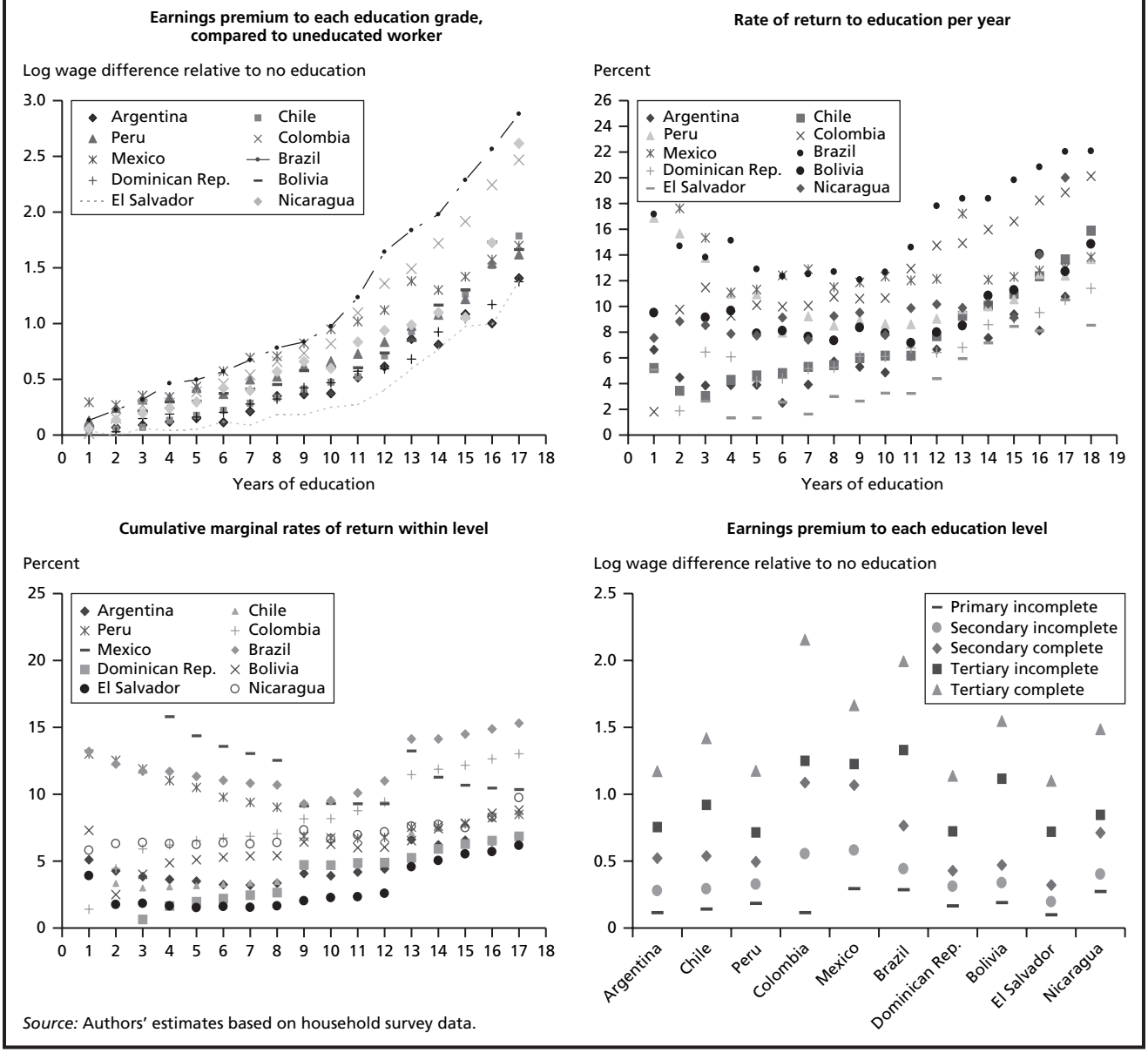
If the returns to tertiary education are high and increasing, why do we not see many more Latin American children (including more of the rich) moving up to the top of the education ladder? A detailed analysis of returns to schooling in our sample of ten countries suggests that the pattern of returns may be an important part of the story behind the persisting educational divide in several of these

countries. There are two main findings. First, returns to education are lumpy, and diplomas often matter a great deal—in many cases education seems attractive only when the long-term investments needed to complete at least a full course of secondary and some tertiary education can be realized. Second, in most countries the high average returns to tertiary education are not available to everyone alike; in particular, poor families tend to accrue returns to their investments in higher levels of education that are significantly below the average market return.

Figure 9.13 presents a snapshot of various measures of the average returns to education in the ten countries. These indicators answer distinct questions about the education investment process. The top left panel shows the evolution of the average earnings premium for schooling as individuals move up each step of the education ladder from no schooling to university completion, while the top right panel simply presents the per year returns that result from dividing this by the number of grades completed. The two panels are informative of the *cumulative* increase

FIGURE 9.13

Average rates of return for education increase at the tertiary level



Source: Authors' estimates based on household survey data.

in average earnings of a successful school progression. In other words, for the family of a child just starting school, it answers the question, "On average, how much will she make if she reaches grade *A* (total and per year completed)?"

The bottom left panel shows the cumulative change in the *marginal* annual returns *within* each education level, computed as a moving average of the grade-to-grade difference in the return coefficients shown in the top right panel. These reveal the *additional* average earnings gains from completing each subsequent grade of primary, secondary, and tertiary education and may be the relevant indicators for the family in deciding whether or not their child should continue in school for an additional year given that she has reached grade *A*. Finally, the bottom right panel depicts the average earnings premium for each level of education defined according to the educational system of each country. The vertical distance between the points gives the *marginal* mean returns to each education level. These returns reflect the actual average value ascribed by local labor markets to a degree and thus capture any labor market signaling effect of degree completion.[19] For the child just starting school, the underlying marginal returns answer the question: "On average, how much more will she make if she reaches/completes education level *X*?" Cross-country comparisons of the data in this panel should be treated with caution due to variations in the structures of educational systems.

As one moves up the education ladder, average returns to schooling increase fairly similarly across countries, although the differences widen considerably at higher grades. The average of annual returns in the ten countries studied is about 6 percent for completion of eight years of basic education, 7.5 percent for secondary school graduates, and 11 percent for university graduates.[20] The lowest and highest returns in the sample are consistently observed in Brazil and El Salvador, ranging from 2.3 percent a year in El Salvador to 9.8 percent in Brazil for an eight-year course of basic education, from 3.4 to 11.8 percent for a secondary degree, and from 8 to 16.9 percent for a five-year course of tertiary education.

Several telling patterns are noticeable. The marginal returns to each subsequent grade stay constant or decline for the first eight years of basic education, increase in the first years of secondary education, and soar with and beyond completion of secondary education.[21] Except for Brazil, Mexico, and Peru, the annual average returns to investment in the basic education cycle are below 10 percent. Argentina, Chile, the Dominican Republic, and El Salvador have notably low average returns to basic education, ranging from 2 to 4 percent a year. Marginal returns are generally higher for those obtaining some or completing tertiary education (bottom panels), while the average returns to completing a full course of secondary schooling are more meaningful in Brazil, Colombia, and Mexico and negligible in Bolivia, the Dominican Republic, and El Salvador. In Argentina, Brazil, El Salvador, and Nicaragua, the full value of a college education accrues only after getting a diploma or completing a full four- to five-year course at a university. Those planning to work and study to finance college have a harder time doing so in these countries.

A key conclusion is that, barring liquidity and access constraints, the value option of getting a secondary or university diploma may be the strongest incentive for poor Latin American youth to break the educational divide. The low and flat returns to basic education in all countries and to high school education in the less-advanced countries suggest that workers who do not finish these cycles, say, workers with four to eight or nine to twelve years of schooling, are highly substitutable in the labor market. It is the completion of successive higher grades that makes earlier school investments more rewarding. Unless the prospects of reaching higher education grades are good, poor youth have few incentives to continue beyond basic education.

Yet do these average returns to education give a fair indication of the incentives to invest in education for everyone? There are two reasons why the answer might be no. First, returns to education can vary across workers according to gender, race and ethnicity, residential location, and other unobserved (unmeasured) characteristics such as quality of education, family background factors, and individual spunk.[22] Second, to the extent that individuals and families act on the expected returns to education in making their schooling decisions, estimates of average returns to education may not accurately represent the actual return to those not currently in school. For example, the returns to tertiary education could reflect the average quality (ability) of those who already have a college education. We now explore the empirical relevance of these issues (except for gender, which is less correlated with poverty and access constraints to schooling).

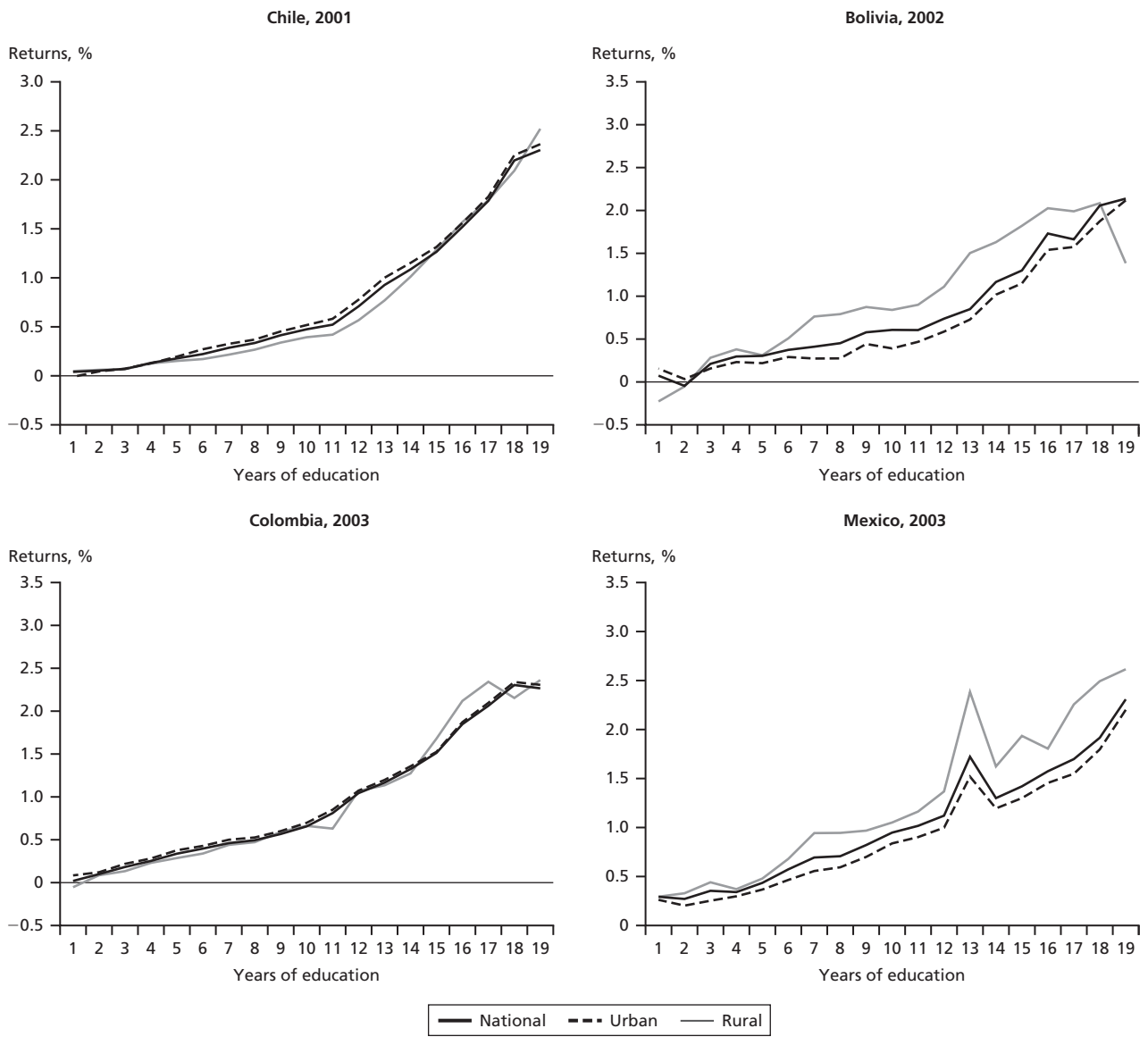
Variations in returns to schooling: Rural and racial dimensions

Earning incentives for rural workers are similar to—in some countries even higher than—those for urban workers. Figure 9.14 illustrates that there are few differences in the returns to education in urban and rural labor markets, and when the differences are more visible, they favor rural workers.

In Brazil, Chile, and Nicaragua, education returns, particularly to secondary education, are mildly larger in urban areas, but in Bolivia, Mexico, and Peru, they are much higher for rural workers over the whole range of levels of education. Other countries, including Colombia, show no gaps between urban and rural workers. These results reflect the growing importance of nonfarm occupations in rural economies. The majority of uneducated rural workers throughout Latin America are employed in agriculture, where education is less productive, while the more skilled hold nonfarm jobs. Since incomes in rural areas start from a lower base, workers in nonfarm jobs get a larger earnings

FIGURE 9.14

The returns to education differ for urban and rural labor markets



Source: Authors' estimates based on household survey data.

kick from education than do comparable workers in urban areas. Hence, a lack of earnings dividends from schooling should not be a first-order deterrent for rural families to invest in education except for those unable to engage in growing rural economic activities.

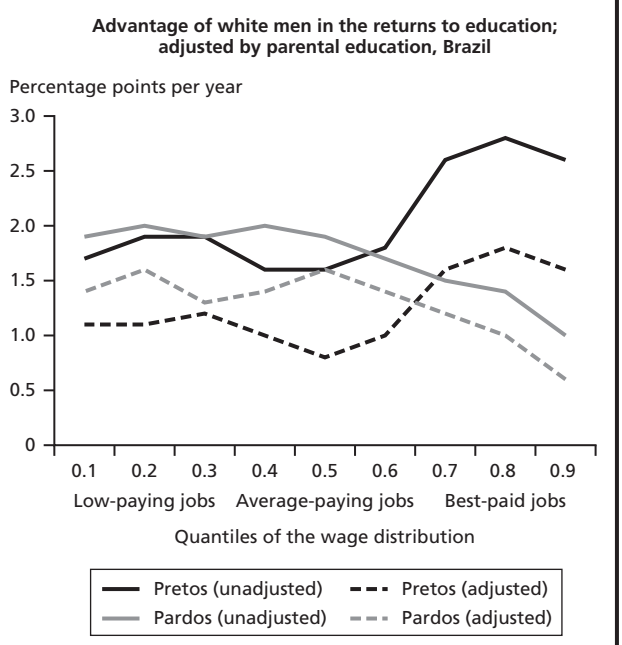
The influence of racial inequality on returns to education is stronger, although labor market discrimination may not be the main culprit. Several studies find that indigenous and Afro-descendant populations are restricted in access to the better-paying jobs. In Bolivia, Brazil, Guatemala, and Peru, these populations have average returns to schooling that are 1 to 3 percentage points lower than whites.[23] That compounds a disadvantage in educational attainment that ranges from an average of two to three full years of schooling.

There is evidence that differences in other components of human capital have a significant bearing on these results. Studies for Bolivia and Brazil (Mercado, Andersen, and Muriel 2003; Arias, Yamada, and Tejerina 2004) show that the lower education quality and parental education of nonwhites can explain more of the gap in returns than labor market discrimination. Differences in the formal education of parents in Brazil account for 1 percentage point of the edge in average returns of white men relative to *pretos* and 0.5 percentage point of the gap relative to *pardos* (mixed-race Brazilians) (figure 9.15). The fact that whites attend school in states with relatively better-quality education further accounts for half of their remaining lead in the returns to education. Overall, after factoring in racial differences in the quantity and quality of individual education and family background, the average earnings gap between white and nonwhite Brazilian workers falls from 46 percent to a 16 percent earnings disadvantage unrelated to workers' productive potential.

However, labor market inequality related to skin color imposes larger earnings penalties on blacks in the higher-paying jobs of any given skills. As shown in figure 9.15, while *pretos* and *pardos* located at the bottom of the salary scale enjoy a similar payoff to education, the best-paid quintile of *pardos* have a schooling return advantage of about 1 percentage point over the best-paid quintile of *pretos* with similar observed skills. This finding is consistent with studies showing that labor market discrimination is more likely when nonwhite workers cannot be denied access to the higher-paying jobs within occupations on the basis of their observed productive attributes (Darity and Mason 1998). While further research is needed to ascertain the sources of ethnic and racial earnings inequality in the region, these populations do face lower incentives to invest in schooling that should be addressed by human capital and labor market policy interventions.

FIGURE 9.15

Differences in returns to education in Brazil largely reflect unequal human capital and a secondary effect of skin color



Source: Based on Arias, Yamada, and Tejerina (2004).
Note: Data for urban areas only.

Unobserved abilities and the returns to the marginal labor market entrant

A flurry of studies shows that returns to education can vary among individuals with the same race, gender, labor market experience, or sector of employment because of the complementarity between education and unobserved earnings determinants.[24] The latter are related to the multiple skills that constitute an individual's scholastic and labor market abilities that may create more channels for acquiring higher levels of education as well as the higher-paying jobs for any given level of education. Data on the quality of schools, family background, labor market connections, and characteristics of communities in early childhood can serve as proxies for these abilities but are often absent in household surveys. Nonetheless, it is important to factor in these and other sources of variation in the costs and benefits of schooling across families and individuals.

Average returns to education can misrepresent the actual incentives faced by less-schooled individuals to move up the education ladder. Two distinct possibilities are relevant (Carneiro and Heckman 2003; and Card 2001). First, there may be "cream skimming," in which the best-quality students (those with higher abilities or higher returns) are more likely to get a university (or secondary) education, while the less talented (low returns) are more prone to join the pool of the less educated. In this case the returns for individuals with low propensity to attend university (the less talented) will be lower than the average return for the already college educated. Second, faced with binding liquidity constraints, many talented high school dropouts may be unable to attend university despite high expected earnings gains. That is particularly true for those in the best-paid unskilled jobs who face higher forgone earnings if they opt to continue their schooling. Thus, many marginal entrants to college may actually have returns above the average return to current college graduates. Which effects predominate depends on the strength of the correlation between schooling costs and benefits along income lines and education levels. In either case the average returns to secondary or university education are insufficient to assess the schooling investment incentives for youth randomly selected from the population or for those from disadvantaged families.

How does this issue bear on the question of underinvestment in human capital and poverty? The second case above is a clear-cut example of schooling underinvestment caused by credit constraints that may be addressed through conditional cash transfers or student loan programs. In the first case more evidence is needed on the role of long-term family factors or other externalities in generating low returns to education to assess the case for underinvestment. For example, if returns are low in general because of a deficient school system or unsound economic policies, then from a private perspective, families' schooling investments may be "just right" for existing returns.[25] The most appropriate policies to promote more education need not bear a direct link with poverty.

Differences in empirical measures of schooling returns across income groups can be informative about whether short-term liquidity constraints or long-term family effects are more significant. Since very poor families should face more binding liquidity constraints, their measured returns to education could be higher because at the margin only the more talented (with very high expected returns) become more schooled. However, returns would be higher for more affluent families to the extent they have an edge in producing higher scholastic aptitude and labor market skills. While there are bright and industrious individuals in both poor and rich families, the factors affecting a child's readiness to learn, quality of schooling, and labor market connections tend to lower the returns to educational investments of poor families. These disadvantaging effects should be compounded and thus be more visible at higher education levels.

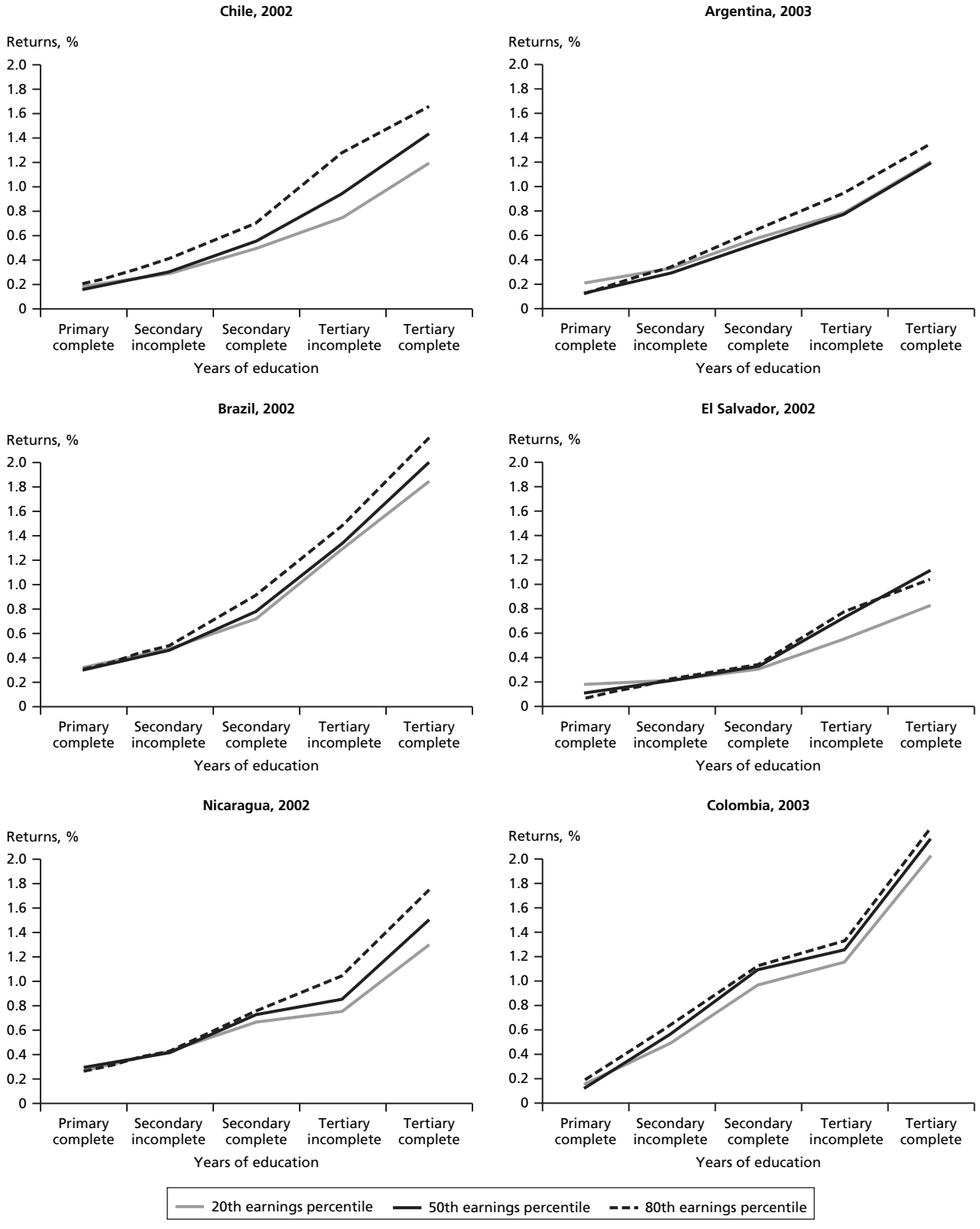
To examine the importance of these issues, we estimate a series of returns to education and assess whether returns are lower for poor families. We fitted earnings functions through 10 different percentiles of the conditional wage distribution in each country, that is, for workers located at the bottom to the top of the salary scale adjusted by their demographics and skill levels. Figure 9.16 illustrates the returns to each level of education for workers in the 20th, 50th and 80th wage percentiles in selected countries, which represent the schooling returns to the low- average- and best-paid workers at jobs of any skill level.[26] Taking the position of workers in the adjusted salary scale as a proxy of their unobserved ability, differences in returns along the salary scale reflect variations in their unmeasured skills.

In most countries returns to schooling, particularly at the tertiary level, are higher for workers who have the best-paid jobs for their skills. The differences are quite large in Chile, El Salvador, and Nicaragua, where the top-rank (high ability) college workers enjoy returns to tertiary education that are 30 to 40 percent larger than the returns for the college-educated in jobs with lower pay. Returns for basic and secondary education are similar to the average return except in Brazil and Chile, where returns to completion of secondary education are 30 to 40 percent larger for the best-paid workers. Only in the Dominican Republic and Peru are the returns roughly similar throughout the earnings scale.

There is further evidence that the poor tend to benefit less from higher education. Figure 9.17 illustrates the results of following a procedure that maps the schooling returns of workers (implicitly reflecting rankings of unmeasured human capital) to the rankings of per capita incomes of their families (see annex 9A). Returns to a university education (complete or incomplete) tend to be higher for the richest families in all countries where we observed significant differences. The gaps in returns between the rich and the poor are somewhat muted (20 percent in Chile and 40 percent in Nicaragua, for example), reflecting the fact

FIGURE 9.16

Returns to each level of education for the three tiers of the earnings distribution

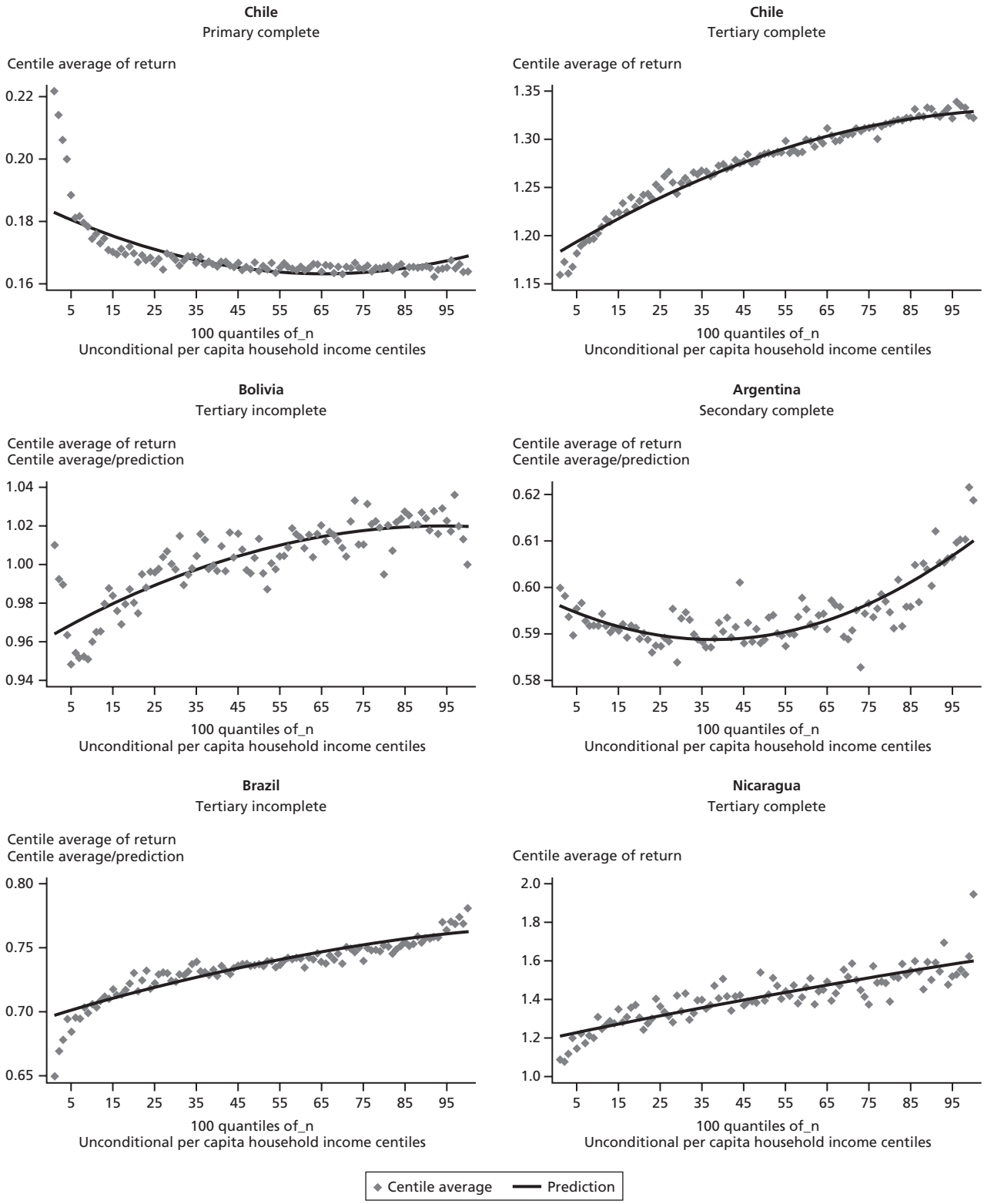


Source: Authors' estimates based on household survey data.

Note: The three tiers (20th earnings percentile, 50th earnings percentile, and 80th earnings percentile) are adjusted by experience, gender, and area of residence.

FIGURE 9.17

Correlation between returns to each level of education and poverty



Source: Authors' estimates based on household survey data.

that some workers from poor families also benefit from unobserved labor market abilities that are complementary to schooling. However, the poor face lower returns to tertiary education returns, since they tend to have a disproportionate disadvantage in the production of skills at home and school. Note that returns to basic and secondary education are fairly constant along family income lines and, in some countries like Argentina, Colombia, and El Salvador, may slightly favor the poor. The low and flat returns to lower levels of education offer similar investment disincentives to the poor and the rich.

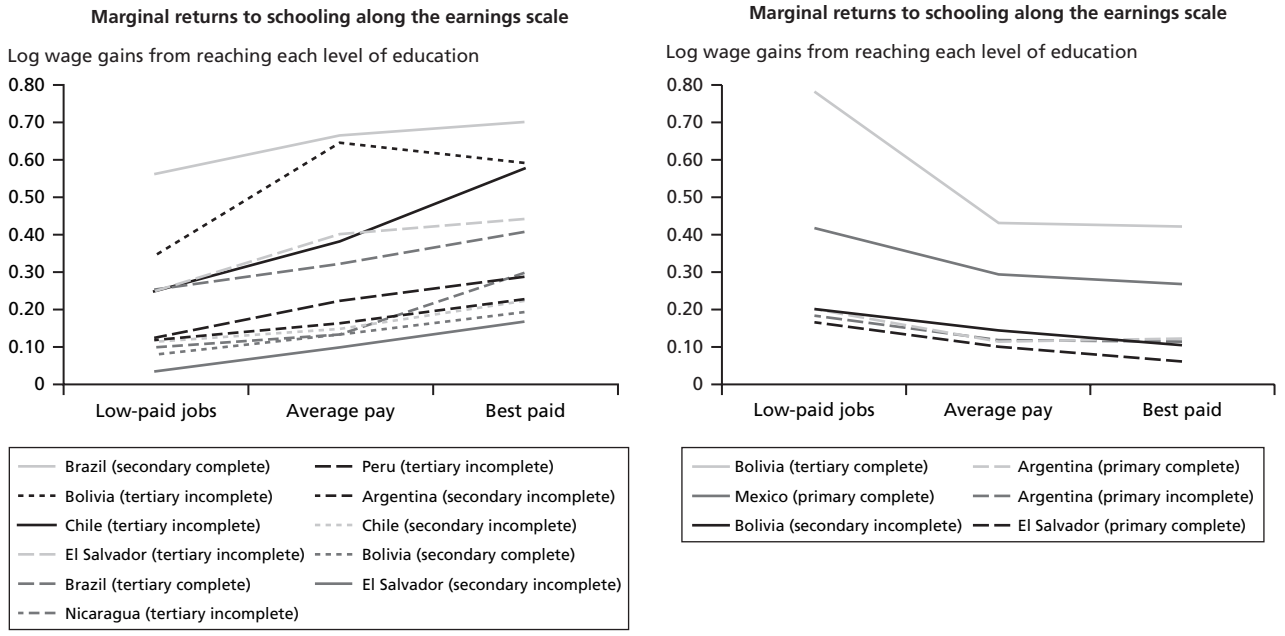
Figure 9.18 shows that differences in schooling returns blur the incentives to make additional investments in secondary and higher education for workers that rank low in the adjusted salary scale (those with lower unmeasured skills). For example, in Bolivia and Chile the marginal earnings gains from having some tertiary education are close to 80 percent for the best-paid workers, but only 30 to 40 percent for those who end up in the less-well-paid jobs. The differential returns are less staggering in other countries like El Salvador and Nicaragua but are still significant and add up to overall low marginal returns to tertiary education.

Bolivia is one of the few countries in the sample where marginal schooling returns are higher for workers at the bottom of the job ladder; this happens in the transition from primary to secondary school and for completion of tertiary education. Recall that marginal returns to having some tertiary education are lower for the low-ranking Bolivian workers. That is, the few low-ranking Bolivian workers who reach tertiary education enjoy a relatively larger boost in earnings along the way but end up with similar returns to the investment once they get a university diploma. The latter is highly suggestive that liquidity constraints hinder transitions to higher grades in Bolivia.

What lies behind these differences in the returns to schooling? As noted earlier, education and incomes may be highly correlated across generations. The poor are also constrained by longer-term family factors that affect both educational achievement and adult earnings, such as home schooling, family wealth (which buys quality schooling), and family connections. Family background and school quality—information rarely collected in survey data—remain unaccounted for in the analysis, which may cause us to misrepresent the returns to education, as well as the impact of short-term liquidity constraints in educational attainment.

FIGURE 9.18

Returns to education are generally lower for workers at the bottom of the earnings scale



Source: Authors' estimates based on household survey data.

An examination of the data in Colombia and the Dominican Republic, the only two countries with reliable parental education data in recent household surveys, indicates that the offspring of more-educated parents do enjoy higher earnings, but returns to education are not vastly overstated as a result. Failing to purge parental effects on the earnings of their offspring overstates education returns by only 3–7 percent, except for the returns to primary education for low-paid workers and to tertiary education for the best-paid workers, which are overstated by 40 percent and 11 percent, respectively. Similarly, as shown in figure 9.18, Arias, Yamada, and Tejerina (2004) found that the returns to education in Brazil are about 10 percent overstated due to the joint impact of family background on the education of children and youth and their earnings as adults. While still sparse, this evidence is remarkably consistent with the consensus of the literature that estimates returns to education in the United States to be slightly overstated by about 10 percent. This suggests that the estimated returns to education shown here are not severely misrepresenting the earnings-schooling relationship.[27]

In addition to the well-known positive effect on children's educational attainment, the education of parents boosts the earnings of sons and daughters. In Colombia and the Dominican Republic, children's earnings are increased by 20–35 percent (7–15 percent) for each parent with a college (high school) education compared with a parent with primary education. This could reflect an impact on returns to education that is difficult to isolate with cross-section data. Using longitudinal data, Altonji and Dunn (1996) found that returns to schooling are higher for children of more-educated parents. In Brazil, Arias, Yamada, and Tejerina (2004) found substantial earnings payoffs to higher levels of parental education that vary across race groups. Father's education generates more significant earnings gains for whites, while mother's schooling was more important to boost the earnings of nonwhites. The authors interpret these as suggestive that father's education plausibly proxies wealth and thus school quality and family connections in the labor market. Meanwhile mother's schooling more closely captures differences in the home production of skills in light of the low female labor force participation at the time workers were schooled. This means that effects of parental education need to be accounted for before interpreting a correlation between low family incomes and low educational attainment as evidence of short-term liquidity constraints.

The spare evidence on the impact of school quality in Latin America suggests that it is a significant source of variation in the returns to education. The Arias, Yamada, and Tejerina (2004) study for Brazil measured the impact of education quality on schooling returns from cross-state and intercohort variations in pupil-teacher ratios—proxies for education quality. Figure 9.19 illustrates its main finding: workers educated in states with a lower pupil-teacher ratio (say, by 10 students) have higher average returns to education (by 0.9 percentage point for each year of schooling). Large class sizes are not uncommon for Latin American poor children, especially those in marginal urban schools. The pupil-teacher ratio is also correlated with other key inputs of the educational process, such as instructional time, educational materials, and teachers' education and experience. In another study for Brazil, Albernaz, Ferreira, and Franco (2002) found that other indicators of school quality, such as teachers' educational level and school infrastructure, have significant effects on children's educational performance. Mizala and Romaguera (2002) summarize the evidence for other countries in the region. Therefore, differences in education quality could plausibly account for an important portion of the gaps in returns to education between the poor and nonpoor in the region. This highlights the critical importance of enhancing the quality of the educational supply for the poor.

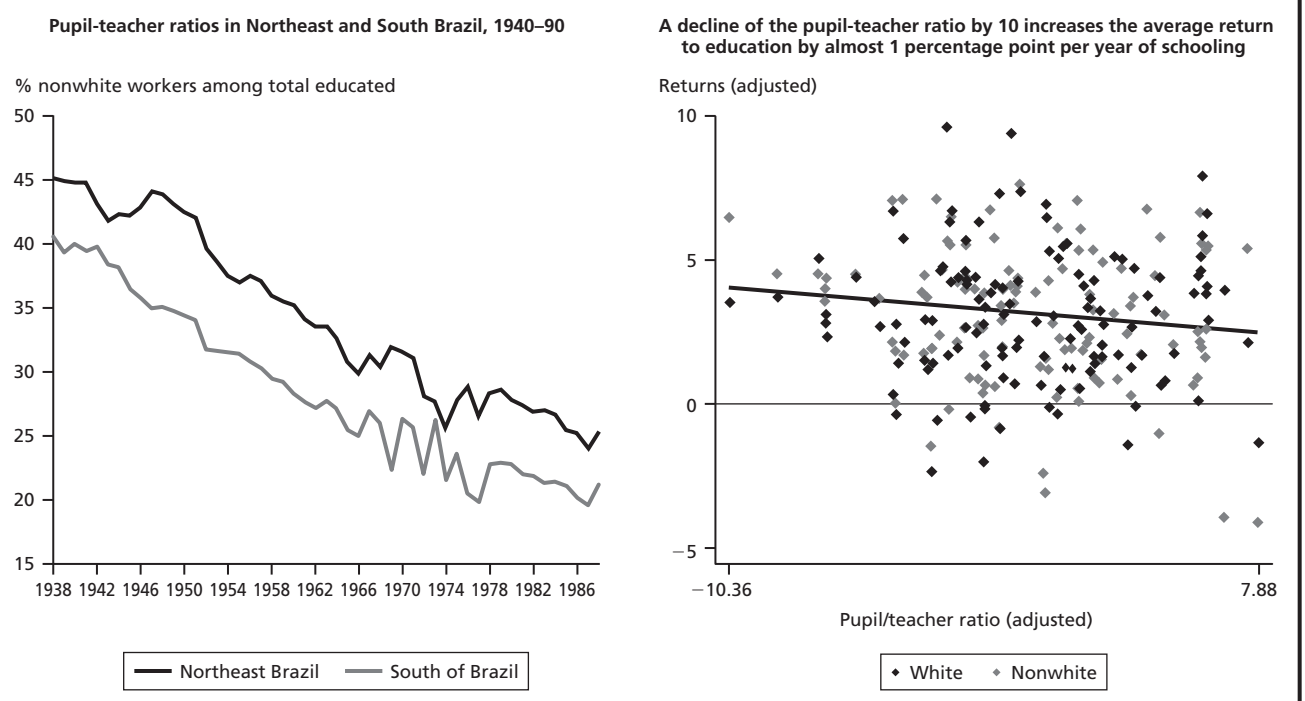
To summarize, the high value ascribed to a university education in Latin America is not available to everyone. College-educated workers with lower unmeasured human capital, particularly the poor, do not receive the same returns to their education as do other workers with college education. Long-term family factors, particularly education quality and parental education, appear to be important determinants of the productivity of schooling investments and earnings as adults. While the total returns to tertiary education for the poor are still significant, even mild liquidity constraints could quickly take children and youth from disadvantaged families off the path to reaching higher education grades. In the next section we weigh the evidence on the relative contribution of short-term and long-term poverty factors to Latin America's persistent educational divide.

Short-term or long-term poverty: Which is more pressing for schooling investments?

We discern the relative importance of liquidity constraints and long-term family factors in preventing Latin American children from getting sufficient schooling to escape

FIGURE 9.19

Education quality differences lead to differential returns to education in Brazil



Source: Arias, Yamada, and Tejerina (2004).

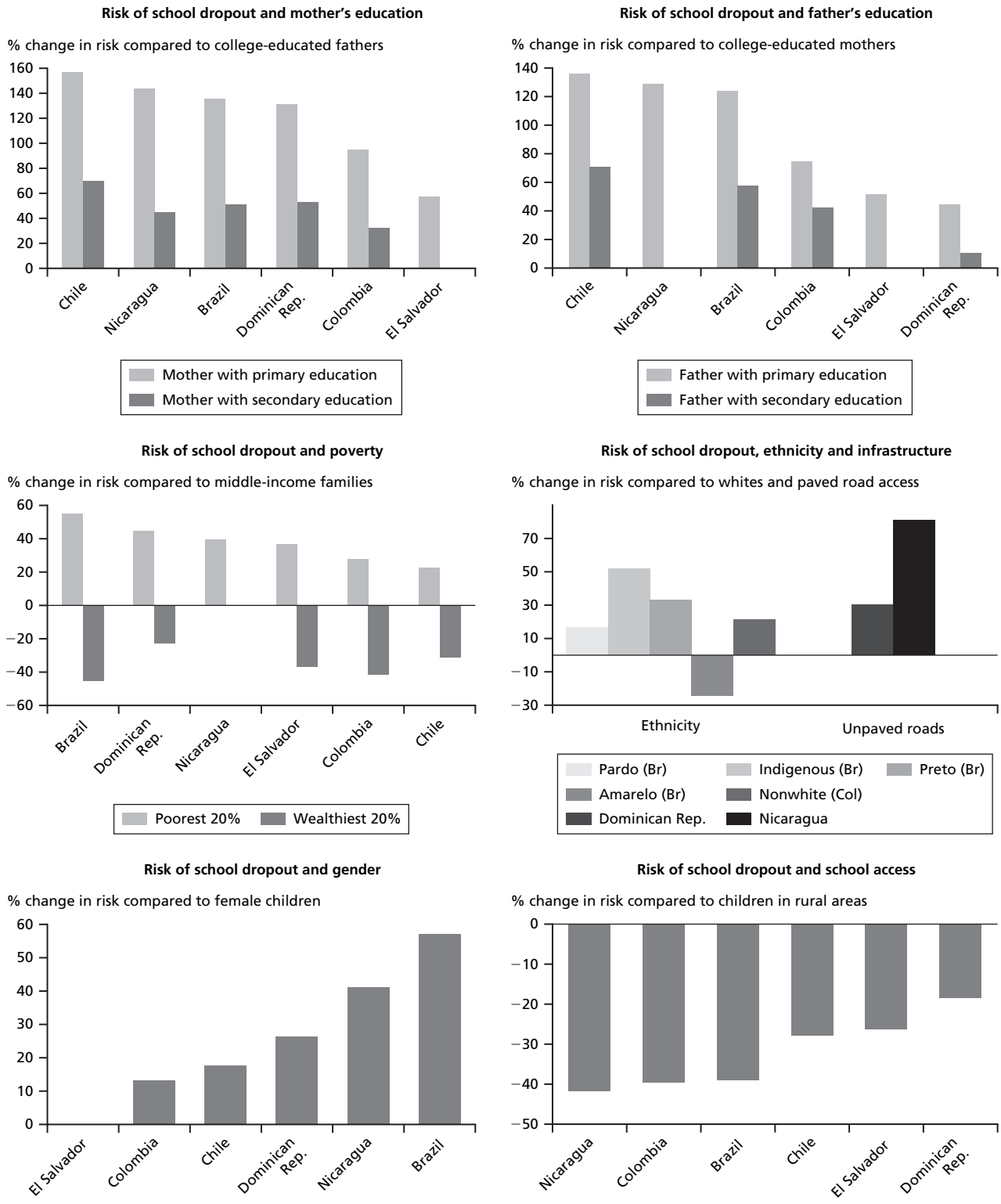
Note: The left figure is based on administrative school data from the *Anuario Estatistico do Brasil*, various years. The right figure shows the fitted regression of estimates of the average education returns by state, cohort, and race and the associated pupil-teacher ratios. Both variables are depicted as deviations from their means within cohort. Returns were estimated for male household heads with Mincer earnings regressions controlling for parental education.

poverty by means of survival (hazard) regressions (see annex 9A). This analysis is common in clinical studies of the effect of a new drug treatment on patients' chances of "survival" from a disease after a certain time has elapsed. We examine how child and family characteristics affect the risk that children and adolescents (6–25 age range) fail to enroll in school (primary, secondary, or tertiary) at a given grade (a proxy of school dropout) given the number of grades already completed, thus capturing the sequence of the entire schooling investment process.[28] Incomes, proxies of physical access, returns to education, and family demographics could be considered "treatments" to the extent they can be manipulated by specific policy interventions. School variables that affect the learning and schooling process are not explicitly part of the analysis due to lack of data, so their effect is captured by family socioeconomic characteristics that influence the capacity to access better-quality schools. The analysis is conducted for Brazil, Chile, Colombia, the Dominican Republic, El Salvador, and Nicaragua to illustrate the effects along the region's gradient of educational development. Figure 9.20 illustrates the main results. The findings are summarized below.

• *Family effects do matter a great deal*. Compared with having a college-educated mother, having a mother with only primary education increases the risk of school dropout by as much as 160 percent in Chile and 60 percent in El Salvador. A father with low education *additionally* increases the risks of school failure by up to 140 percent in Chile and 40 percent in the Dominican Republic. These are substantial impacts given the high degree of assortative mating in the region. These risks are cut by one-half or two-thirds when the parents have a secondary education; children of Central American fathers with high school education have the same chance as children of college-educated fathers to move up the educational ladder. In Colombia, having *grandparents* with little education increases the risk of school failure of children and youth even when parental education, incomes, and other family characteristics are accounted for. That is, low educational attainment in Colombia tends to persist

FIGURE 9.20

Factors that have an impact on moving up the educational ladder



Source: Own estimates based on household survey data.

Note: These are the risk ratios in percentage terms from a hazard regression of school attainment on a set of family characteristics. In Colombia and the Dominican Republic, regressions include grandparents' education.

strongly across three family generations. The effects of the education of the mother and grandmother are remarkably similar but are lower for grandfather's than for father's education (see figure 9.19). It seems plausible that simultaneous conditioning on current income and parental and grandparents' education yields cleaner measurements of liquidity constraints and the quality of skills development at home and schools. Thus the results affirm that both short-term and long-term family factors (family background, liquidity constraints) and the quality of schools are central to accelerate human capital formation in the region.

There is further evidence that higher expected returns to education (at higher grades) and a better-quality home environment correlate with more stable school progressions. Children from nonwhite families face a higher risk of leaving school early: 20 percent in Colombia and Nicaragua, and 17 to 52 percent for *pardos*, *pretos,* and indigenous people in Brazil. Moreover, children and youth in female-headed households face a three to four times bigger risk of dropping out of school in Brazil, Chile, and the Dominican Republic, although school dropout is not affected by whether the mother is a salaried employee or self-employed. Since we are purging income and family background factors, the latter effects plausibly reflect the lower expected returns to education for nonwhites, as well as the constraints on single parents in providing quality school supervision of children (such as doing homework) and role models. Although the effects are small, some evidence shows that the expectation of higher returns to education at higher grades also encourages more-even school progressions. Using a proxy, albeit imperfect, of the differential schooling return that children might face due to abilities inherent to their families, we find that those with higher family returns for secondary completion (Brazil and Nicaragua) and college education (Chile and Nicaragua) are less likely to drop out of school.[29] Altogether, these findings further reaffirm the role of long-term family factors in enhancing the productivity and incentives for schooling investments.

• *Liquidity constraints play a relatively smaller but significant role.* Children and youth from the poorest 20 percent of families face a higher risk of school failure compared with those from middle-class families: the difference ranges from 55 percent in Brazil to 20 percent in Chile. This risk is half as large for families in the second quintile and then tapers off the richer a family becomes, suggesting that being below a subsistence threshold interferes with school progression. For example, in Nicaragua only children from the poorest 40 percent of families face a higher risk of school failure than the richest families. In El Salvador and Nicaragua, international remittances—which in this context are a relatively more exogenous income source—lower the risk of school failure, although modestly. Boys, irrespective of whether they are rich or poor, face a much higher risk of dropout than do girls in Brazil, the Dominican Republic, and Nicaragua (40–60 percent), and a modestly higher risk in Chile and Colombia (13–17 percent). Moreover, each additional young sibling (age 6–12) increases the risk of school failure for any one of the siblings (by 4 to 22 percent across countries), while more children of secondary school age actually lower the risk in Brazil, the Dominican Republic, and El Salvador (by 5 to 22 percent). All of these effects were obtained controlling for parental education and proxies of family returns to education and are thus highly suggestive that liquidity constraints are binding, to different degree, in all of the countries.

• *Physical access constraints remain operative, binding most when returns are higher.* The risk of school failure is 40 percent higher in the rural areas of Brazil, Colombia, and Nicaragua (all countries with higher returns to education) and 20–30 percent higher in the rural areas of the Dominican Republic and El Salvador (with the lowest returns). Deficient infrastructure (proxied by unpaved roads) increases the risk of school dropout by 80 percent in Nicaragua and by 30 percent in the Dominican Republic. The poorest regions in Brazil, Chile, and Colombia, where basic infrastructure is generally more deficient, show higher risks of school failure, but these become weaker or even reverse signs after adjusting for family socioeconomic characteristics. Migrants are at higher risk for dropping out of school in Colombia (15 percent, in part perhaps capturing violence-related displacement), Nicaragua (45 percent), and the Dominican Republic (70 percent); only in Brazil do they face lower risk (5 percent). However, school supply does not seem the most prevalent consideration for migration. For instance, only 14 percent of Dominicans age 3–22 who migrated in the past five years stated school-related reasons; a similar fraction sought income opportunities.

What conclusions can we draw from these results and the preceding analyses? The main lesson is that long-term family factors, liquidity, and school access constraints conspire, in different degrees, to generate human capital underinvestment traps that hinder sustained and balanced

educational progression in the region. The two main elements interacting in the resulting vicious cycle are a pattern of schooling returns that makes it unattractive for many poor families to invest in education, namely, returns that are low and flat in the eight-year basic education cycle, rise significantly at the tertiary level but are lower for poor families and only occasionally mature fully when a degree is completed; and liquidity constraints stemming from subsistence incomes and borrowing constraints.

The extent of underinvestment traps and the relative weight of the intervening factors varies across countries. A few patterns can be identified that are likely responsible for reinforcing educational divides within countries:

- Chile, Colombia, and Peru are the countries relatively better positioned in our sample to experience a faster transition toward a diamond-shape (broad secondary base) educational distribution; these three countries are favored by relatively high and smoother returns to schooling and a relatively lower fraction of the prime-age population with very low education (less so in Colombia). Potential limiting factors are unequal schooling returns (especially in Chile) and liquidity and learning constraints related to family educational and wealth endowments and ethnicity, which result in home and school quality gaps for the poor's offspring.
- Bolivia's unequal educational transition and Nicaragua's very low educational attainment result from a similar set of limiting factors, with a strong role played by liquidity constraints exacerbated by relatively high returns that materialize fully only near or upon degree completion and by larger gaps in secondary school infrastructure. The low levels of skills in these two countries pose a high risk that they will fall into a self-reinforcing cycle of low technology, low demand for skills, and low innovation and skills investments.
- In Argentina, a high fraction of poor families with low parental education, low returns to the primary and secondary education cycle, uncertain tertiary returns (maturing with degree completion), and high discounting of the future may be preventing poor children from sharing in the fast transition of recent age cohorts to largely free secondary and tertiary public education.[30]
- Brazil's low schooling attainment and high educational inequality likely arise from the interplay of multiple sources: high but very unequal returns (which are lower for the poor) to secondary and tertiary education, persistent intergenerational family effects, pressing liquidity constraints, and localized supply bottlenecks. Mexico's sharp educational divide reflects a similar though less marked situation, as Mayer-Foulkes (2004) has more fully documented.
- Finally, the acceleration of educational transitions in the Dominican Republic and El Salvador is constrained mainly by exceedingly low returns to education on top of already low overall earnings, largely related to poor readiness to learn (a result itself of low parental schooling) and particularly deficient education quality.[31] Thus, liquidity constraints in these countries do not appear to be as important as increasing the incentives of families to make sustained investments in education.

These are not intended as exhaustive explanations of the low educational attainment in these countries, but as important links to poverty and its intergenerational transmission. Similar patterns may be operative in other Latin American countries where poor children and youth do not succeed in completing higher grades. Each merits detailed examination in specific country studies incorporating institutional analyses of the educational systems.

Implications for human capital formation policies

This chapter examined how Latin America's educational divide between two groups of low and highly educated individuals is simultaneously a source and a result of subsistence incomes across generations. As for any investment, the confluence of opportunity (attractive returns) and possibility (liquidity, quality schools, and home environments) is essential to human capital accumulation. Poor Latin American families lack elements from both in different degrees. The main overall implication of the results discussed here is the need for integrated, long-term strategies for skills development that exploit the synergies in the life-cycle human capital accumulation process in which both families and schools play a central role. Specific implications for human capital formation policies (nutrition and health, education, and training) are:

• *Leveling the initial playing field for children at risk*. It is imperative to address the unequalizing impact of deficiencies in early-childhood development and deficient parenting on the educational attainment of poor children and their capacity to command higher returns to education as adults. Although nutritional failures are very hard to remedy after the child's first two years, almost half of Latin American and Caribbean countries are not on track to meet the UN Millennium Development Goal of halving malnutrition by 2015.

Well-targeted interventions to strengthen the capacities of families to create early human capital should be prioritized. For example, conditional cash transfer programs can be used to induce parents to devote more attention to children's health and nutrition by conditioning transfers on maternal and infant health care. The experience with the Head Start program in the United States and similar interventions elsewhere in the world can serve as a guide for more systematically targeting infants at long-term risk. Although costly, these interventions are very likely to pass rigorous cost-benefit assessments because of their demonstrated long-term impacts on children's readiness to learn and socioeconomic success as adults.

• *Strengthening the full option value of education for the poor.* Since families factor in the promise of the payoff to higher education in their investment decisions, educational policies should adopt a systemic view. Fragmentary educational policies, focused solely on ensuring narrow objectives such as primary completion or coverage goals, are no longer as effective in the global economy where a minimum of secondary education is needed to compete for above-subsistence wages. While scarce resources and political capital require setting spending and reform priorities, removing binding supply and demand constraints at all levels of the education system, even on a small scale, is crucial to signal low-income families that their educational investments have better chances of maturing with improved access to higher grades.

Where education returns are high and basic infrastructure is deficient, public investments in the construction and upgrading of schools and roads are essential. The development of multigrade schools, learning from best practices such as the Colombian *Escuela Nueva* and the Chilean MECE Rural, can address supply constraints cost effectively. Public-private partnerships to exploit good-quality private urban secondary schools with excess capacity and other modalities such as distance education can be considered when the preconditions for their success exist.

Liquidity constraints have been the main motivation for cash transfers to the poor tied to school attendance, as in the *Oportunidades* program in Mexico, *Bolsa Escola* in Brazil, and similar programs in Central America and the Andean region. The opportunity cost of children's school attendance does not seem very binding until the child completes primary school or reaches the lower secondary grades. Schemes that encourage investments throughout full courses of basic education or lower secondary education (for example, a lump-sum grant for those graduating from high school) may hold substantial promise for reducing dropouts and inducing poor parents to invest more time helping their children succeed in school.

Well-designed (means-tested and merit-based) university student loan programs and scholarships also have a role in facilitating access for low-income and high-performing students. These should build in features to ensure their sustainability, such as delegation of loan processing and recovery to private banks with partial government guarantees on the repayment. These loan programs may be more feasible with the gradual development of individual credit registries that increase the long-term costs of a default. Moreover, a strategic partnership with the private sector (including private universities) and civil society is needed to fund and operate these programs through competitive biddings. Needed also are policies to promote the development of the tertiary education market, such as those discussed in de Ferranti and others (2003).

• *Making education count for the poor.* The take-up rate on student loans—or for that matter enrollment in free public universities—may be low because eligible persons perceive that their expected returns to tertiary education do not compensate for the forgone earnings. Gaps in enrollment in secondary schools and above persist in Argentina, Brazil, and Mexico, where public university is largely free. Thus, policies are needed to increase the returns to education for the poor to encourage them to move up the education ladder.

The main challenge is to gain a better understanding of how to reduce grade repetition among the poor. The role of automatic promotion policies in the early grades, learning deficiencies due to poor learning environments at home, and failures in the instruction process, including inadequate teaching and large class sizes, should be analyzed

with data on schools, children, and family characteristics through vigorous impact analyses.

Possible policies include decentralizing school management to get parents more involved and committed to their children's school progress, offering incentives to encourage qualified teachers and principals to work in disadvantaged schools, adapting innovations to improve learning environments in disadvantaged schools and communities, upgrading textbooks and school aids, providing teacher training, and expanding computer education in secondary schools. The consistent application of international standardized tests to assess performance progress should become common practice. Unfortunately, there is not a well-tested recipe to follow, but rather a host of international experiences, both failures and successes to learn from.

Some targeted and performance-based increases in public expenditures, particularly at the secondary level, might be needed in some countries. While overall education expenditures in most countries in the region are not low and increases in spending do not always translate into better outcomes, there might be limits to what can be achieved with pure efficiency gains unless expenditures in education are increased. Countries such as the Dominican Republic and others in Central America have clear expenditures deficits and are already relatively output efficient, so a sustainable increase in education expenditures is needed.

Other policies to improve access to jobs may include enacting and enforcing antidiscrimination laws and establishing intermediation services that help well-educated ethnic and racial populations obtain greater access to better-quality jobs. Where returns to education are too low, the best medium-term policies lie in promoting technology-intensive investments that demand skills. This is actually a precondition to ensuring a country's ability to maintain attractive private returns to higher levels of education under a massive educational expansion.

• *Interventions to fill minimum instructional gaps of the adult population.* Given the strong family effects we have shown here, especially of parental education, there is a role for programs targeted at improving the educational level and skills of the adult population. Recent experiences in Chile and Mexico in support of lifelong learning hold some promise. For instance, the national *Chile Califica* program is designed primarily to strengthen the link between what is taught in the latter years of secondary schools and what the labor market demands.

Investing now: The demographic window of opportunity

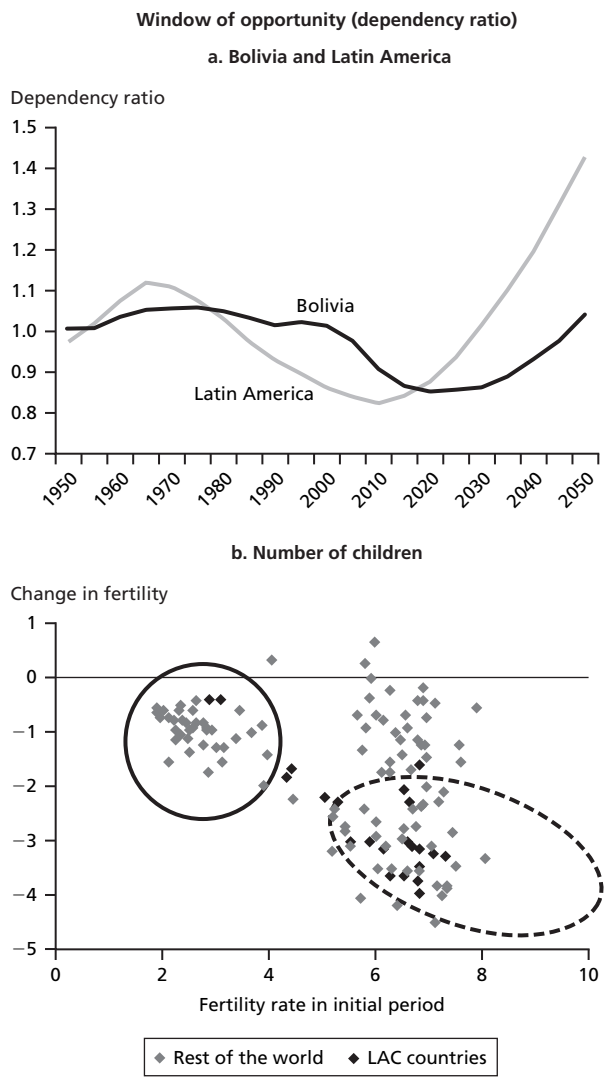
Demographic forces offer many countries in the region a unique opportunity to translate the human capital accumulation of young cohorts into a more productive labor force and a faster reduction in poverty. Most countries are in the midst of a demographic transition where the "dependency ratio" (the fraction of the population that is too young or too old to work) is declining. This is illustrated in figure 9.21 for Bolivia; Bolivia and Haiti are the only Latin American countries just beginning the first stage of demographic transition. As countries go through this transition, labor force participation is expected to rise. Because the share of younger cohorts in the working-age population will rise faster, older and poorly educated workers can be replaced with younger workers at a fast pace. Most Central American countries just recently started this process and can still reap most of these benefits, while the rest of the region is much more advanced but still has a decade or so to take advantage of the transition.

As the bottom panel of figure 9.21 shows, changes in fertility in most of the region are favorable to human capital accumulation. In almost every Latin American country today, fertility rates are falling, families are having fewer children, and women are increasingly joining the labor market. This means more resources to invest in quality education for children as well as lower costs of making the investments. But patience is required. This is a gradual transition, and it will take more than a decade for skill investments to translate into a more productive labor force and improvements in national and family incomes.

Human capital formation, including schooling, is an extremely time-dependent process. For families unable to do it at the right time, the opportunity is gone. In Argentina, 30 percent of workers ages 41–65 and 20 percent of prime-age workers are stuck with a basic education that puts those heading families at high risk of poverty. These families have to wait a decade or more before any schooling bequests to their young children can lift family incomes significantly. Further taking into account the positive spillovers of a labor force with rising minimum levels of education on technology adoption, productivity, and growth, it is hard to overstate the critical importance of pushing the "education for all" agenda. In many countries, the demographic window of opportunity is closing; the time to invest is now.

FIGURE 9.21

The demographic transition and human capital accumulation—an opportunity that should not be missed



Source: IDB (2004), and authors' estimates based on cross-country data.

Note: Dependency ratio = (population age 65 and older or 15 and under)/population age 15 to 64.

The best policies, in terms of a social cost-benefit calculation, may not be the most palatable for short political horizons or for political economy reasons. Such is the case with early-childhood interventions and major reforms of the educational system. Overcoming political failures that prevent consensus around the need to address the large achievement gaps between poor and nonpoor children is critical to the region's long-term human capital accumulation and prospects for sustained growth.

Annex 9A

Data and methodological details

Data

We employ household living conditions and labor force surveys for 10 countries chosen to represent the different levels of educational development in the region. Below are the countries, the national household survey data sets used in the report, and their educational ranking:

Andean Countries: Bolivia, ECH-MECOVI 2002; Colombia, ECV 2003; Peru, ENAHO 2002.

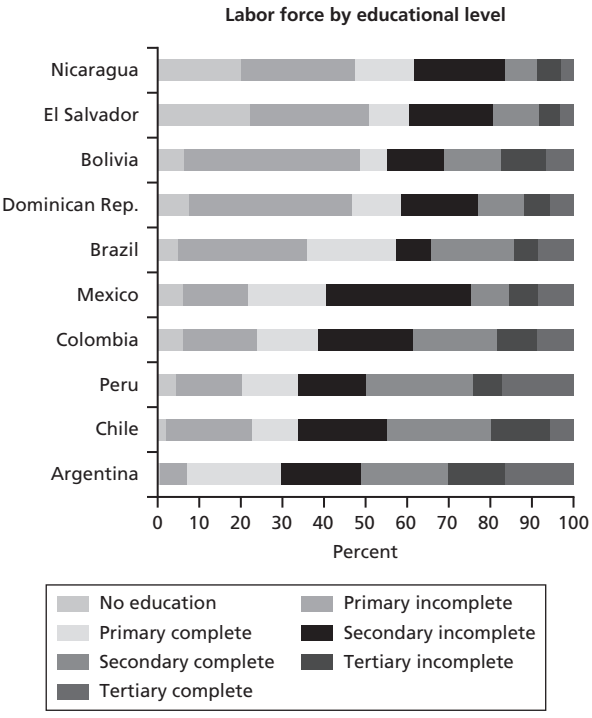
Central America and the Caribbean: El Salvador, EHPM 2002; Mexico, ENIGH 2000; Nicaragua, EMNV 2001; Dominican Republic, ENCOVI 2004.

South America: Argentina, EPH 2003; Brazil, PNAD 2002; Chile, CASEN 2001.

Estimation of returns to education

We rely on Mincer earnings functions: Ln $W_{ij} = a_j + b_j\, educ_{ij} + q_j\, X_{ij} + e_{ij}$, *with* j = quantile of the earnings distribution. We are primarily interested in the b_j (returns to education), controlling for some demographic characteristics

FIGURE 9A.1



Source: Authors' estimates based on household surveys.

(X_{ij} = gender, urban/rural). Education is specified as a set of year dummies for the last grade completed (a total of 18) and as 6 dummies for the maximum level of education (incomplete and complete). Marginal returns to education are derived from the difference in log wages between two consecutive grades or education levels. We estimate these equations for 20 percentiles of the earnings distribution using quantile regression to assess the consistency of the behavior of returns along the distribution and report results for selected quantiles.

Linking returns to education to poverty

To map the quantile returns to education to the per capita family income distribution, we employ the following methodology, used by (Arias (2004) and Tannuri-Pianto, Pianto, and Arias (2005).

Quantile regression allows us to measure heterogeneity in the returns to education that is not related to measured worker characteristics. The ranking of workers in the conditional earnings distribution can be taken as a proxy of their level of "ability," or unmeasured earnings determinants. We would like to link these conditional returns to workers' positions in the (unconditional) per capita household income distribution.

To do this, we first identify the conditional quantile of each worker in the wage distribution. We perform quantile regressions for 20 quantiles and then identify the quantile to which each worker belongs as the quantile for which the worker is predicted to have the smallest wage residual (in absolute value). That is, the conditional quantile of worker i given by θ_i is determined as $\theta_i = \arg\min_{\tau}(\varepsilon_{\tau i})$, where $\tau = 0.05, 0.2, \ldots, 0.95$. We assign to each worker the estimated education coefficient for his or her level of education and given quantile β_{θ_i}.

Next we compute household-specific returns for each level of education by averaging the return coefficients across workers who belong to the same household. This implicitly averages the level of "ability" of working members to obtain the family return to education. We then regress the household-specific returns for each education level on the (unconditional) household's percentile, C_i, in the per capita household income distribution. The samples in these second-stage regressions are composed of households with positive returns. We consider two specifications, the first including only dummies for the five quintiles and the second, the unconditional percentile and its square. To properly gauge the statistical significance of the results, the second-stage regressions are weighted to account for the standard errors of the estimates of quantile return coefficients from the first stage Mincerian equations.

Estimation of hazard "schooling-progression" functions

To ascertain the role of factors affecting the cost and expected benefits from continuing schooling, we employ Cox hazard regression methods (see Cox Edwards and Ureta 2003 for a first application to school attainment).

Hazard (risk) analysis is synonymous with time-to-event analysis, which studies a variable that measures the duration between a particular starting time (entrance to school) and a particular end time of interest (school dropout), and a set of independent variables thought to be related to the end-time variable (school dropout). In general, censored observations arise whenever the dependent variable represents a time to event, and the duration of the study is limited in time. In this case, the time to event is the time between completion of a one-year study period and the time the child drops out of school. Subjects that are not enrolled at the time of the survey and did not complete a full education course (primary to college) are assumed to have dropped out. The individuals who are enrolled represent censored observations, since they have not yet completed their entire education spells. The method of analysis takes the censoring into account and correctly uses the censored observations as well as the uncensored observations.

Assuming away reentry after a temporary absence from school, schooling attainment is the last grade completed before the failure to enroll, that is, the years of completed schooling. The event that schooling attainment G takes the value g is equivalent to the event that the child drops out of school after achieving g grades. Thus, the probability of failing to enroll in $g + 1$ matches the probability of attaining g years of schooling, conditional on past enrollment decisions. From this we can derive the risk, or hazard rate, of dropping out of school after completion of grade g and before the completion of grade $g + 1$, given that the child has continuously been in school up to the $g + 1$ enrollment time. A "failure" event here is to drop out after grade g, which exactly corresponds to the failure of enrolling in $g + 1$ at the beginning of the school year.

The hazard rate in this case is the probability that an individual will drop out of school at a certain point in time (at risk of dropping out), that is, the rate at which dropouts

occur. The aim of the analysis is to determine how the independent variables (covariates) described below affect the school dropout rate. For example, if a child has a hazard rate of 1.2 at six years of education and a second child has a hazard rate of 2.4 at the same time, then the second child's risk of dropping out would be two times greater at six years of education.

We use the Cox's Proportional Hazard model, which assumes that independent variables exert a proportional effect on the baseline hazard rate of school failure. Cox's regression model is a semi-parametric technique that models:

$$(9A.1) \quad h[(t), (z_1, z_2, \ldots, z_n)] = h_0(t)e^{(b_1z_1 + \cdots + b_mz_m)},$$

where $h[(t), (z_1, z_2, \ldots, z_n)]$ denotes the hazard ratio, given the values of the covariates. The term $h_0(t)$ is known as the baseline hazard, that is, the hazard for the respective individual when all independent variable values are equal to zero. This can be estimated through a linear model of the form:

$$(9A.2) \quad \log\left\{\frac{h[(t), (z_1, z_2, \ldots, z_n)]}{h_a(t)}\right\} = b_1z_1 + \cdots + b_mz_m$$

The estimated coefficients can be interpreted as relative risk ratios. The baseline survival curve is shifted up or down by each of the covariates. The proportional hazard technique estimates a coefficient for each independent variable that indicates the direction and degree of flexing that the predictor has on the survival curve. A coefficient equal to 0 (relative risk ratio of 1) means that a variable has no effect on the baseline hazard; a positive coefficient (risk ratio greater than 1) implies that larger values of the variable are associated with a greater risk of school dropout; and a negative coefficient (risk ratio less than 1) means a lower risk.

The hazard regressions include a full set of family characteristics: gender of the child, area of residence, family per capita income, international remittances when available, the number of children ages 6–12 and the number ages 13–17, education of the father and mother (for the sample that still live with their parents), whether the household is headed by a female, whether the mother and father work as salaried workers or are self-employed, some interactions of these variables, and regional control dummies.

Two important features of the analysis are examinations of the effect on enrollment of liquidity constraints and of the unobserved component of the family return to education. For the first we use two specifications, one controlling for the log of income per capita, and another including a set of dummies for the family's income quintile. The latter is useful since liquidity constraints are consistent with nonlinear income effects; in other words, the poorest households (first income quintile) should be relatively more constrained than, say, the not-so-poor or the middle-class households, especially for sending their children to private schools. For the second issue, we use the average return to education of each family computed from all working household members (ages 26–65) and their rank in the conditional wage distribution (that is, the return at the percentile at which they fall in the distribution), as explained above. The latter is a proxy, albeit imperfect, of the expected differential return that a child or youth might face from each level of education due to the abilities inherited from his or her family. These returns for each level of education (primary to college completion), adjusted by their estimated standard errors, are included in some of the hazard regression specifications.

School variables are missing from the schooling regression analysis. This means that family background variables, that is, parental education, also capture family wealth effects that allow access to better-quality schools. Also missing are variables capturing the scholastic ability of children. In an uneasy truce with available data, we hope any biases are ameliorated by the controls for family background variables (especially in Colombia and the Dominican Republic, where grandparents' education is included) and by imputed measures of family earnings abilities.

Notes

1. Card (1999), Lemieux (2004), and Heckman and Todd (2004) offer a comprehensive review of the literature. Psacharopoulos and Patrinos (2004) provide a large set of cross-country empirical results.

2. The poverty rates are based on national poverty lines and therefore should not be used to make comparisons or rankings across countries.

3. The most recent reports can be found in www.worldbank.org\lac\poverty.

4. As reported in de Ferranti and others (2003), high-performing countries in East Asia increased their average schooling by just under five years between 1960 and 2000, while most countries in Latin America and the Caribbean increased theirs by two to three years. during this period.

5. See Mayer-Foulkes (2004) for a review of numerous studies, and also the 2005 *World Development Report*.

6. This happens when employers regard these workers as more talented (more productive) so that a diploma acts as a signal of their productivity, as illustrated in the job market signaling model of Nobel Prize winner Mike Spence.

7. This important distinction is present in the various studies of Heckman and coauthors on human capital accumulation and heterogeneous returns to schooling. See, for example, his Nobel Prize lecture (2000).

8. See Mayer-Foulkes (2004) and Heckman (2000) for empirical evidence from numerous studies.

9. When parents cannot set a higher educational bar by example, children and youth could turn to relatives, peers, or mentors. Durlauf (1996), Bénabou (1994), Manski (2000), Akerlof and Kranton (2002), and sources in Bowles, Durlauf, and Hoff (2004) show how these mechanisms can generate low human capital formation and poverty traps. Lalive and Cattaneo (2004) present evidence of the impact of social interactions on schooling decisions.

10. See, for example, Lucas (1988), Azariadis and Drazen (1990), Kremer (1993), and Acemoglu (1997) for growth and poverty-traps models of skill agglomerations, and De Ferranti and others (2003) for empirical evidence on the correlation between technological and skills investments in Latin America and the Caribbean.

11. Behrman, Duryea, and Székely (1999) conclude that 80 percent of the slowdown in educational progress in the region in the 1980s and 1990s was associated with macroeconomic volatility. Carneiro, Hansen, and Heckman (2003) find supporting evidence of a negative effect of variation (uncertainty) in the returns on college attendance in the United States.

12. The patterns tend to persist between families given the high degree of assortative mating on the basis of education (de Ferranti and others 2004). Distributions by gender reveal that girls and boys have about the same level of school attainment in most countries.

13. Only the Dominican Republic shows a relatively equal, flat distribution of schooling for both the rural and urban labor force. Argentina's household survey does not collect data for rural areas.

14. The cohorts cover those individuals born in 1980–90, 1965–79, and 1940–64.

15. See, for example, World Bank (2004a) for Central America as well as recent country poverty assessments. In a few countries, such as the Dominican Republic, the income-enrollment gaps are modest (World Bank 2005b).

16. It is obtained by cumulatively adding age-specific net enrollment rates. For example, if the net enrollment rate in a given country is 86 percent at age 6 and 93 percent at age 7, the average 7-year-old in the country has spent 1.79 years in school. See Urquiola and Calderón (2004) for more details.

17. Some examples of answers in each category are: (1) Work related: need to work, economic difficulties, and help at home; (2) low benefits: not interested, low grades, and too old; (3) limited access: remote school, difficult to get to, and lack of slots; (4) other: sickness, pregnancy/maternity, military service, and miscellaneous. In Colombia, insecurity includes those reporting they stay home because of insecure streets and being displaced.

18. The private sector accounts for more than half of the university market in Brazil and Colombia, close to 40 percent in Chile and Peru, and 20–30 percent in Mexico. Annual tuition costs are almost equivalent to per capita income in Brazil and Colombia and 30 to 50 percent of per capita income in Argentina and Chile (de Ferranti and others 2003).

19. The surveys in Chile, Colombia, the Dominican Republic, Mexico, and Nicaragua contain information to distinguish individuals with a tertiary (university) diploma. In the other countries, tertiary completion was assigned to those with five years of tertiary education or more.

20. The estimates of returns are comparable to those reported in de Ferranti and others (2003), being within 2 percentage points difference in some countries, but differ from those reported in IDB (2004), which are generally much larger. The difference stems from surveys, samples (IDB 2004 is restricted to prime-age men), and measurement methodology (treatment of incomplete and complete degrees). We impose fewer restrictions on the sample and estimating equations.

21. The high school graduation effects are weaker in the Dominican Republic, Mexico, and Peru. In Brazil and Colombia, returns jump in the 11th grade, the last year of secondary school in these countries.

22. Education alone accounts for up to one-third of overall earnings differentials in Latin America and the Caribbean. The fraction of the variance in earnings explained by education, gender, and region of residence is as high as 0.48 in Brazil and Colombia and as low as 0.05–0.10 in rural areas of El Salvador and Nicaragua (given that there is little variance in earnings differentials in rural areas). Other factors, including differences in education returns, contribute to earnings inequality in the region.

23. See Hall and Patrinos (2004) and Jiménez and Landa (2004) for Bolivia; Trivelli (2004) for Peru; Larrea and Montenegro (2004) for Ecuador; Arias, Yamada, and Tejerina (2004) for Brazil.

24. This strand of studies is growing exponentially. See, for example, Carneiro, Heckman and Vytlacil (2001); Carneiro (2003); Carneiro, Hansen, and Heckman (2001, 2003); Carneiro and Heckman (2003); and Arias, Sosa-Escudero, and Hallock (2001) for the United States. See Blundell, Dearden, and Sianesi (2005) for European countries. For numerous Latin America countries, see World Bank (2004); Arias, Yamada, and Tejerina (2004); Arabsheibani, Carneiro, and Henley (2002); Lopez-Acevedo (2001); Montenegro (2001); and Saavedra and Maruyama (1999).

25. From a social standpoint, there could still be a case for public intervention to address underinvestment given the positive externalities of education in the form of lower fertility, crime, and the like.

26. The grade-specific return profiles are similar to those in the top left panel of figure 9.12, that is, returns are relatively constant in the transitions between education levels.

27. Card (1999). Other, somewhat dated, studies for Brazil (Lam and Schoeni 1993), Panama (Heckman and Hotz 1986), and Peru (Behrman and Wolfe 1984) report higher upward biases in education returns after purging the effects of parental education and other family variables on earnings and educational attainment. Their findings might suggest this effect may depend on the stage of educational development of the country. Another issue is that controls for variables highly correlated with own schooling such as parental

education may exacerbate a downward bias in the estimated returns to education when people misreport their education.

28. Cox Edwards and Ureta (2003) first applied these methods to study school transitions in El Salvador; Raymond and Sadoulet (2003) recently used it to study impacts of the Mexican *Oportunidades* program.

29. The effects are small given the little range of variation in imputed returns. An average return to each education level is imputed to each family using the education returns at the percentile where all working members (ages 26 to 65) fall in the conditional individual earnings distribution (that is, their ranking in unobserved earnings determinants).

30. Herrán and Van Uythem (2001) show that students who drop out often belong to families where the parents have no more than a primary education, while parents of those staying at school have completed more than nine years of education.

31. World Bank (2005b).