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Parental Resources, Schooling Achievements, and Gender Schooling Gaps: Evidence of Change over 25 years in Rural Guatemala

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Abstract

We use village census data and linear regression models to examine changes between 1975 and 2002 in the associations of parental resources with boys' and girls' schooling in four rural Guatemalan villages. Levels of schooling in 1975 were universally low for children 7–17 years. Large increases in schooling achievements occurred between 1975 and 2002. By 2002, schooling levels were comparable for younger boys and girls (7–12 years, $N = 3,525$) and favored older boys compared to older girls (13–17 years, $N = 2,440$) by about 0.5 grades. The associations of household standard of living and maternal schooling with schooling among girls diminished over time and became more comparable with these associations among boys, and the associations of household standard of living with schooling among older boys declined and became more comparable with these associations among girls. Thus, as increased social investments reduce the costs of schooling or increase the supply and quality of schooling to families, the magnitudes of the associations between parental resources and children's schooling decline and become more gender equitable at all ages. However, our results show that older boys may benefit more than older girls from social investments in schooling. These changes suggest potential needs to monitor gender gaps in schooling retention among older children, to insure gender equitable access to

social investments in schooling, and to encourage parents to invest in schooling as joint measures to achieve greater schooling achievements of girls and boys.

Keywords

Gender gaps; Central America; Guatemala; Parental resources; Schooling; Social change

Introduction

Schooling attainment in lower-income countries is associated with many positive outcomes for individuals, including better health and nutrition, enhanced cognitive skills, lower fertility, and greater productivity and earnings (Behrman and Deolalikar 1995; Behrman et al. 2010; Caldwell 1980; King and Mason 2001; Lloyd et al. 2000, 2005; Schultz 1988). Schooling attainment also is associated with positive intergenerational outcomes, including improved child-care practices, higher rates of child survival, and better child health (Desai and Alva 1998; King and Mason 2001; LeVine et al. 1991; Lloyd et al. 2005; Schultz 1993). Many of these associations are strong for men, and most of them are even stronger for women (King and Mason 2001; Lloyd et al. 2005; Schultz 1993).

In the 1960s and 1970s, average schooling attainments were low in most lower-income countries, and large gender gaps favoring boys were widespread.¹ Since then, schooling enrollment and grade attainment have increased substantially (Lloyd et al. 2005; Wils and Goujon 1998). Growth in school enrollment has been rapid, in some countries exceeding the pace of change that occurred in the historical transition to universal schooling in the West. Growth was even more rapid for girls than for boys, so that in many lower-income countries, gender gaps in schooling have narrowed, disappeared, or even reversed (Wils and Goujon 1998). In much of South America, for example, girls now have slightly higher rates than boys of primary grade completion and grade attainment (Grant and Behrman 2010; Lloyd et al. 2005).

Despite overall gains in schooling and reductions in schooling gender gaps that once favored boys, nearly one-third of poorer countries still have not achieved gender parity in primary education (World Bank 2011). The National Research Council-Institute of Medicine Panel on Transitions to Adulthood concluded that increasing schooling attainment and reducing lingering gender gaps, especially at the higher levels of schooling, should be priorities (Lloyd et al. 2005). These recommendations echo the United Nations Millennium Development Goals, which include the elimination of gender disparities at all levels of schooling, as well as the universal completion of primary school by 2015 (United Nations 2005).

Studies of children's schooling achievements in lower-income settings often stress the role of *parental resources for investments in children* (Behrman 1997; Behrman and Knowles 1999; De Vos 2001; Holmlund et al. 2011; Maralani 2008). First, if parental income constrains investments in schooling because they must be largely self-financed, then increases in schooling achievements may follow increases in parental resources. Second, if parental investments in the human capital of girls are a luxury relative to such investments in boys, then increased parental resources also may reduce the gender gap favoring boys in schooling achievements. In contrast to studies in lower-income settings, studies in higher-

¹Following Glasser and Smith (2008), we use the term gender gap to describe changes in or even reversals over time in the relative schooling achievements of boys and girls as well as changes over time in the associations of parental resources with the schooling achievements of sons and daughters. Evidence of either set of changes would support the idea that gaps in the schooling achievements of boys and girls are, at least in part, socially constructed.

income settings stress the role of *social or public investments in children*, such as the expansion of governmental support for schooling (Casciano and Massey 2012; Deluca and Dayton 2009). To date, relatively few studies in lower- or even higher-income settings simultaneously examine the roles of parental resources *and* social investments in schooling (Parcel et al. 2010).

In this paper, we use community histories and repeated censuses fielded between 1975 and 2002 in four rural Guatemalan villages to examine changes, if any, in the associations of parental resources with boys' and girls' schooling achievements, accounting for local social investments in children's schooling and the local economic environment. Three measures of schooling achievement are considered: whether the child ever attended school, achievement relative to where the child should have been for his or her age (the schooling progression ratio), and grades attained. Examining the associations between parental resources and boys' and girls' schooling achievements over a period of broader social change can improve our understanding of the relative importance of parental versus social investments in education. Such an understanding is useful to design the combination of supply-and/or demand-side policies required to maximize the schooling achievements of boys and girls.

Determinants of Child Schooling

Sociologists often view achievements in schooling as resulting from a process of socialization, in which important role models establish norms for children's behavior. From this view, parents typically are the primary role models, and their behaviors, aspirations, values, and expectations about schooling directly affect children's development and academic achievement (Jacobs and Harvey 2005; Kaplan et al. 2001; Kloosterman et al. 2011; Sewell 1963).

Complementarily, economists often argue that familial behavior is an important determinant of children's schooling achievement (Becker and Tomes 1986). Adults in the family—again, typically the parents—make decisions about the production and use of family resources, including those that are invested in children. Such models of household decision-making assume that parents care about the economic capabilities and successes of their children, and make “expenditures on their skills, health, learning, motivation, ‘credentials’, and many other characteristics” to enhance their children's human capital (Becker and Tomes 1986: S5). The nature, amount, and share of familial resources that are allocated to children, as well as the timing of those allocations, may affect children's achievements, including their entry, progression, and grade attainment in school. Children also are affected by other parental choices concerning, for example, the neighborhood of residence, number of offspring, or other aspects of family structure. These parental resources and choices can influence children's schooling outcomes in part through the time that parents spend with their children (Guryan et al. 2008; Sandberg and Hofferth 2001; Sayer et al. 2004), including on “educational” activities (Chikako 2010; Guryan et al. 2008).

Although the hypothesized mechanisms in these sociological and economic models differ, their implications are similar regarding the potential importance of parental resources. More parental resources will be associated with higher schooling achievements for children.

Parental Resources and Children's Schooling Achievements

Among the parental resources considered in such analyses, the most common has been parental human capital, typically measured by schooling attainment. Across a range of studies, the associations of parental schooling with children's schooling are positive and significant. In one review mainly of studies in lower-income countries (Behrman 1997), measures of maternal schooling were associated more strongly with children's schooling

attainment than measures of paternal schooling, in just over half of the 21 countries considered. Yet, in a review of 17 studies mainly in wealthier countries (particularly the U.S. and Europe), only six showed stronger associations of maternal than paternal schooling (Holmlund et al. 2011). Reviews and studies of the causal effects of parental schooling on children's schooling show that the estimated *relative* effects of maternal and paternal schooling often depend on the econometric identification strategy (Holmlund et al. 2011), but that the effects of parental schooling, even if more modest than Ordinary Least Squares (OLS) estimates might suggest, tend to be positive and significant (de Haan 2011; Holmlund et al. 2011).²

In addition to the parental schooling, the role of family income (or wealth) has been studied extensively. Behrman and Knowles (1999) surveyed results from the U.S. and 21 lower-income countries and found that family income was in most cases significantly positively associated with children's schooling. Yet, the strength of this association varied, depending in part on whether short-run or longer-run indicators of income were used. Recent analyses of panel data from the Japanese General Social Survey show that childhood poverty negatively affects the probability of college graduation in models that control for the endogeneity of poverty (Takashi et al. 2010). Welfare experiments in North America show a positive effect of parental income on the schooling achievements of young children (Duncan et al. 2011). Yet, other economic variables such as parental employment (Schildberg-Hoerisch 2011) and home ownership (Mohanty and Raut 2009) do not appear to affect children's schooling attainment in wealthier settings, with controls for household income and unobservables.

With some exceptions (Ainsworth 2002), studies in the U.S. and Europe suggest that growing up in a one-parent family (or experiencing divorce or marital separation) is negatively associated with children's schooling attainment, though the estimated strengths of these associations vary (Case and Katz 1991; Ermisch and Francesconi 2001; Graham et al. 1994; Seltzer 1994), and in some cases, lose significance with controls for endogenous family structure (Francesconi et al. 2010). In Argentina and Panama, children 13–16 years living with parents in consensual union, with a single parent, or with no parent have lower odds of attending school than do children living with legally married parents (De Vos 2001). In research on the effects of marriage by previously single mothers, the educational gains to children are modest and accrued by those of more educated mothers (Wagmiller et al. 2010).

Social Investments and Children's Schooling Achievements

In a critique of the literature on the determinants of children's schooling attainments, Haveman and Wolfe (1995) have argued that economic and sociological models have over-emphasized the role of parental resources for investment at the expense of other potentially relevant determinants. They propose a more comprehensive framework that also includes *social* investments in children, i.e., the choices that society or governments make that affect the opportunities available to children and their parents.³

Social investments in children often are operationalized with measures for the attributes of a child's neighborhood and school (Casciano and Massey 2012; Deluca and Dayton 2009). The potential role of neighborhood attributes has received substantial attention in this

²The data for the present study do not permit us to investigate such possibilities, so we explore associations, rather than causal relationships, among the study variables.

³The choices of children, given prior investments in them and prior opportunities available to them, also influence their schooling attainments (Haveman and Wolfe 1995). We argue that in poor settings where norms of collectivism and parental authority are stronger and children are relatively young at the time of schooling attainment decisions (because levels of schooling attainment are lower), parents are more likely than children to control decisions about investing in schooling.

literature; yet, the mechanisms by which neighborhoods may influence children's schooling outcomes are complex. Poor neighborhoods may diminish educational attainment partly through lower levels of positive adult socialization and collective efficacy (Ainsworth 2002; Card and Rothstein 2007; Connell and Halpern-Fisher 1997; Garner and Raudenbush 1991; Sampson et al. 2008). Neighborhoods also may alter young peoples' expectations about the value or use of schooling (Lillard 1993; MacLeod 1987). Although research suggests that parental resources may matter more than neighborhoods (Brooks-Gunn et al. 1997a, b; Sampson et al. 2002), neighborhoods may affect parental resources directly, for example, if residential location affects opportunities for work (Holzer 1991; Ihlanfeldt and Sjoquist 1998; McLafferty and Preston 1992). Also, neighborhoods may influence parenting styles, strategies for monitoring children, and the social and institutional resources accessible to parents (Furstenberg et al. 1999; Jarrett 1997).

Many researchers have found significant associations of neighborhood poverty with children's poor academic achievement (Brooks-Gunn et al. 1993; Crane 1991; Harding 2003; Rubinowitz and Rosenbaum 2000), although here again the magnitudes of these associations have varied, perhaps in part for methodological reasons. Other observational studies that use the neighborhood's share of home ownership or composite measures for socioeconomic advantage have shown positive associations with children's academic achievement (Crowder and South 2011; Mohanty and Raut 2009). Neighborhood characteristics—including region, the share of adult residents with higher levels of schooling, and the share of neighborhood working persons with professional or managerial occupations—have been positively (but sometimes only marginally) associated with children's schooling attainment (Ainsworth 2002; Datcher 1982; Duncan 1994; Hill and Duncan 1987). Much of this research has been undertaken in the U.S., with unclear relevance for lower-income settings.

Important school-related factors may include the expansion of school infrastructures and improvements in the quality of schools (Behrman 2009; Glewwe and Kremer 2007; Orazem and King 2010). Studies in Western settings have focused less on investments in school infrastructure (Crampton 2009; Metcalf et al. 1998). In lower-income settings, researchers have found positive (Kingdon 2007) and negative or negligible (Dreze and Kingdon 2001; Filmer 2007; Filmer and Pritchett 1999) associations of investments in school availability and infrastructure with children's achievements, but positive associations of some infrastructural variables for girls (Dreze and Kingdon 2001). In some poor rural areas, the concentration and proximity of schools have been more strongly associated with school attendance than are other potential measures of school resources, such as pupil-teacher ratios (Handa and Simler 2006).

Regarding the potential influence of school quality, several researchers have argued that teacher quality and classroom size contribute significantly to student achievement (Behrman and Birdsall 1983; Clotfelter et al. 2007; Jencks and Phillips 1998; Nye et al. 1999; Rivkin et al. 2005). Estimates by others, however, question the longevity of teacher effects (Jacob et al. 2008), and the role of school quality may be small when compared with that of parental resources (Deluca and Dayton 2009).

Contrary to most of the existing literature, Haveman and Wolfe's (1995) depiction of the process of children's schooling attainment is sequential, in that “society” or the government invests directly in children (e.g., by expanding school infrastructures and improving school quality), and thereby shapes the social and economic environment within which decisions about children's schooling are made. Given this broader environment, parents choose how to distribute their time between work and other activities, and then decide how much time and income to devote to their children.⁴ This sequential macro–micro model of children's

schooling attainment suggests that, as changes emerge in the direct social investments in children as well as the (economic) environment in which families live, parental decisions about investments in children's schooling also will change. This prediction has important implications for understanding the role of parental resources for children's schooling attainments in lower-income settings *undergoing* sometimes rapid expansions in their infrastructures and economic markets. Despite the conceptual importance of this sequential macro–micro model, we know of no studies that have investigated temporal changes in the role of parental resources in a historically lower-income setting that has undergone dramatic socioeconomic change and expansion in social investments in children.

To address this gap, we leverage repeated cross-sectional censuses and historical community data from four rural Guatemalan villages and consider three research questions. First, what are the trends and patterns in children's schooling outcomes, parental resources, and community resources in these villages between 1975 and 2002? Second, to what extent do the associations of maternal and paternal resources with children's schooling achievements change over time in a setting undergoing rapid socioeconomic changes and increased social investments in children? Third, do any observed changes in the associations of parental resources and children's schooling achievements differ for girls and boys? Examining these questions will help to understand the associations of parental resources with children's schooling achievements *during the process of macro-social change*, as well as the contribution of changes in the role of parental resources to changes in gender gaps in schooling over time.

Study Setting

The constitutions of all Latin American countries state that education is a right of every citizen (Reimers 1999). Compulsory schooling laws in Guatemala require that children enroll in first year primary if they are 7 years old by the start of the school year. Although school attendance before the compulsory age has increased recently in Guatemala, early attendance still trails that of other countries in the region. For example, at age 5 years, about 50 % of children were attending pre- or primary school in Guatemala in 2006, whereas these rates were much higher elsewhere in the region, including Mexico (94 %), Peru (78 %), Colombia (76 %), Panama (68 %), and even lower-income Nicaragua (60 %) (authors' calculations from household surveys). Also, compared to children in wealthier countries such as Chile and Argentina, Guatemalan children are less likely to start school on time because laws on compulsory schooling are not widely enforced, especially in rural areas (Wyck 1999). As a result, late enrollment remains a problem in Guatemala. Nationally, 12 % of 7 year olds and 9 % of 8 year olds are not enrolled (authors' calculations). The delay in entering primary school is more pronounced for indigenous children than for non-indigenous children (Duryea and Pagés 2003), and correlates negatively with wealth (McEwan and Trowbridge 2007). The problem is also severe in rural areas, with 16 % of 7 year olds and 10 % of 8 year olds not enrolled in school (authors' calculations).

Guatemala fares worse than other Latin American and Caribbean (LAC) countries in terms of enrollment, performance, and disparities in primary and secondary schooling. In 2000, Guatemalan gross and net enrollment ratios⁵ in primary (104, 86 %) and secondary (38, 27 %) school were well-below the LAC average (121:93 % primary; 83:61 % secondary), and rates of repetition in primary school were higher (14 vs 12 %) (World Bank 2012). Gender gaps in schooling in Guatemala also are distinctive. Whereas in 2000, average female-to-

⁴This model ignores the possibility that parents can collectively influence societal or governmental decisions about schooling.

⁵The gross enrollment ratio is the ratio (in percent terms) of all children in school, regardless of age, to the population of school-age children. Net enrollment is the ratio of school-age appropriate children to the population of school-age children.

male net primary and secondary enrollment ratios were greater than or equal to 1.0 in LAC countries, the same ratios for Guatemala were 0.90–0.93 (World Bank 2012).

The educational systems of all Latin American countries have expanded markedly over the last 50 years, with many new schools opened and new teachers hired (Reimers 1999), including in rural Guatemala (Gorman and Pollitt 1992). This expansion in rural Guatemala has occurred despite political instability and substantially slower growth in GDP per capita relative to other LAC countries (World Bank 2012). Still, public resources for schooling in Guatemala remain low. For example, the student–teacher ratio in primary schools in Guatemala was 36 in 1970 and had fallen only slightly to 33 by 2000; whereas, in LAC countries overall, this average ratio was 32 in 1970 and had fallen to 26 by 2000 (World Bank 2012).

With this broader context in mind, individuals in our study are from four Ladino (mixed Spanish-Mayan heritage), Spanish-speaking villages in the Department of El Progreso, about 100 km northeast of Guatemala City in Guatemala. The Institute of Nutrition of Central America and Panama (INCAP) selected these four villages for a study that was conducted between 1969 and 1977 to assess the effects of protein and energy supplementation on the growth and development of preschool children (Habicht and Martorell 1992). Initially, the villages were chosen because of their similar size, social isolation, low levels of schooling (30 % adult literacy), and high rates of malnutrition. Since then, several follow-up studies have ensued, including one in 2002–2004.

Three of the four villages (Santo Domingo, Conacaste, and San Juan) lie in the cooler, more mountainous highlands of El Progreso, whereas the fourth, Espíritu Santo, borders the Motagua River in the hotter, more fertile lowlands (Bergeron 1992). The lifestyles of the residents of all four villages have some similarities, yet socioeconomic and demographic changes have occurred at uneven rates since the 1960s (Bergeron 1992; Engle et al. 1992; Maluccio et al. 2005a). One striking but differential change across villages has been the pattern of labor-market activities. Before the late 1960s, the economies of all four villages were based on small-scale subsistence agriculture (Pivaral 1972). Subsistence farmers in the villages relied heavily on unpaid family labor until the 1980s, when young adults increasingly left the villages for continued schooling or non-agricultural wage work. Today, subsistence agriculture is only a small part of the livelihood strategies of the villagers.

Residents in all villages have a history of seasonal migration for agricultural wage labor, with the rate of migratory wage-labor varying with local demands for labor. Many opportunities for non-agricultural wage work also exist in the national capital of Guatemala City and along the Atlantic coastal highway that runs through this region. These opportunities have become more accessible as roads and bus services have improved, enhancing the prospects for daily commuting. Women have worked as domestic help in the capital since the 1960s and, in the 1980s and 1990s, they began working in higher paid jobs at free-trade assembly and re-export factories (Maluccio et al. 2005a). Especially during the 1980s, many men traveled to the capital for wage work in construction. Masonry (among men) and petty trade (among women) are common forms of self-employment in the villages, and palm-weaving has been an important source of income in Espíritu Santo since the 1960s. Outside industries have contracted (mostly female) villagers to do low paid piecework at home (Murphy et al. 2005; Pivaral 1972).

Primary school in Guatemala includes six grades, and secondary school consists of five to seven grades. The first three grades of secondary school (lower secondary) provide academic and technical skills, and the next two to four grades (upper secondary) provide more specialized training. Students can begin university after they have completed two

upper-secondary grades. Public primary schools have existed in all four villages since the 1960s. At that time, however, the services available at primary schools were deficient. Only four grades were offered until the 1970s (Bergeron 1992), teachers themselves had limited schooling (or training) and often were asked to teach multiple grades, and none of the schools had electricity or running water. Since the late 1960s, schooling infrastructures in the villages have changed at varied paces. Espíritu Santo and Santo Domingo were the first to build cement-block primary schools around 1973. An earthquake in 1976 destroyed the schools in Espíritu Santo and Conacaste, whereas the (adobe) school in San Juan and the (cement) school in Santo Domingo suffered only minimal damage. Permanent schools were rebuilt in the villages during the 1980s, and latrines, water, and electricity were installed in the years afterward.

In 1979, the student–teacher ratio averaged 38:1 across villages, but ranged from 31:1 in Santo Domingo to 51:1 in San Juan. By 1998–2001, student–teacher ratios across the villages had converged at about 30:1. Lower secondary schools were built in all villages in the 1990s except in Espíritu Santo, for which lower and upper secondary schools were located in its Municipal City (the center of local government) only 1 km away. Upper secondary schools also were available in the Municipal Cities of the other three villages. Before and after secondary schools were established in or near the villages, some students traveled to the municipal city Sanarate, El Progreso, or even Guatemala City to study at this level. In addition to expenses for supplies, uniforms, books, and bus fare, other fees are associated with attending secondary school.

Across all four villages, gross primary enrollment ratios rose from 78 % in 1979 to 93 % in 1998–2001. Within-village trends were positive in Conacaste (45 to 88 %) and Santo Domingo (83 to 96 %), constant in San Juan (96 to 97 %), but negative in Espíritu Santo (106 to 84 %). The latter trends in Espíritu Santo may have resulted from the decisions of parents to send their children to a nearby primary school in the Municipal City, especially because of improvements in transportation in the late 1970s and 1980s, the 1976 earthquake, and the perceived higher quality of the nearby school. Rates of primary-school promotion, or the percentage of children graduating from one grade and eligible to enter the next, were between 49 and 56 % in all villages except Conacaste, where these rates rose from 39 to 64 % during the period. Rates of repetition and dropout fell in Conacaste but averaged between 10 and 20 % in the other villages (Maluccio et al. 2005a). Between 1975 and 2002, the mean grades completed rose from 1.4 to 5.0 for those 20–29 years and from 1.3 to 3.9 for those 15–64 years. In 1975, men 20–29 years had 0.6 more grades of schooling than their female peers, and by 2002, men's advantage among 20–29 year-olds had risen to 0.8 grades. In the mid-1990s, girl-to-boy ratios of promotion and enrollment were below one in all villages except Conacaste (Maluccio et al. 2005a).

In research using data from these villages for the 1970s, maternal schooling and housing quality, but not father's occupation, were negatively associated with children's age at entry into school and positively associated with passing and maximum grade attainment (Gorman and Pollitt 1993). Also, in models adjusting for preschool ability and maternal education, housing quality remained significantly negatively associated with age at entry and significantly positively associated schooling attainment. Changes over time in the association between parental resources and children's schooling outcomes were not assessed (Gorman and Pollitt 1993).

Methods

Data

The data for this analysis come from detailed village histories and censuses conducted in 1975, 1987, 1996, and 2002. The censuses relied on an identical methodology within constant village boundaries and consisted of an interview with the heads of all nuclear families.⁶ The following nuclear family-level data were collected: civil status and religion of head(s), fertility of the female head, housing attributes, and ownership of consumer durables. Gender, date of birth, current location, self-reported literacy, schooling attainment, and occupation also were collected for all individuals who were de facto residents during each census. Information on all individuals surveyed in prior censuses was updated in successive censuses if they were still present. As a separate activity, village histories using a range of qualitative and quantitative methods have been undertaken several times since 1965 (Bergeron 1992; Murphy et al. 2005; Pivaral 1972). We used these histories to generate quantitative data on changes in school infrastructure, school quality, and economic markets in each village from 1960 to 2002.

We focused on girls and boys who were residents in any of the four study villages and who were 7–12 years (1,679 girls, 1,846 boys) or 13–17 years (1,110 girls, 1,330 boys) during any one of the census rounds. The age of eligibility for the sample was the age in completed years at the date of each census interview. Studying children in these age ranges is appropriate for two reasons. First, these children should have started primary school by the age of 7 years, and if progressing on schedule, would have finished the third year of lower secondary school by the age of 17. Second, older individuals were more likely to have migrated, so excluding them from the analysis reduces potential biases resulting from higher selective out-migration or in-migration.

We considered three measures of schooling achievements, namely (1) *ever schooling*—whether the child ever attended formal school, (2) the *schooling progression ratio*—the number of grades that the child attained divided by the potential number of grades attained, given the child's age and assuming that the child started school on time at the age of 7 years and completed one grade each year after that, and (3) *grade attainment*—the highest grade that the child completed.

Measures for parental resources included maternal grade attainment, paternal grade attainment, a z-score for household standard of living, and whether or not the child was co-resident with two parents, all measured at the time the child was 7 years old. The z-score for household standard of living was derived from the first component of a principal components analysis of a list of common household consumer durable assets as well as attributes of the housing structure (e.g., type of floor and roof) of each child's (maternal) household (Maluccio et al. 2005b). The scale was constructed by pooling cases across *all* census years and villages so that the score for child *i* in household *h* and census year *t* can be compared with another child's score in any village and census year. Because we estimated the score for all households, examining the sub sample of households with children in our age ranges did not lead to a mean z-score of zero or standard deviation of one for the observations in this analysis.⁷

⁶A nuclear family was defined as (1) a couple (including their children, if any), regardless of whether they lived on their own or with others such as parents, or (2) a single adult, with children and/or pregnant, regardless of whether s/he lived on their own or with others, or (3) a single adult living alone.

⁷All models also control for the small percentage of missing data on these parental and house hold attributed with dummy variables indicating for an observation when a value is missing and has been replaced with the median for that village and census year.

Village-level variables, all measured before the child was 7 years old, were assumed to reflect social investments in children, or the local infrastructure and economic conditions that existed at or leading up to the age at which each child should have entered school. By construction, these measures differed across villages and birth-year cohort within villages. The indicators included the average number of teachers per grade and the average number of grades offered in the local primary school, for each child measured over the 5-year period before he or she turned 7 years old.⁸ The indicators also included the number of years that an all-weather access road (with a hardened road surface and well defined drainage) from the center of the village to the nearest paved highway outside the village was available before each child turned 7 years old, and the percentage of adults 15–65 years who were working in wage labor when each child was 7 years old. Lastly, we controlled for all observed or unobserved fixed village attributes that may be associated with children's achievements in schooling by including village dummies for Santo Domingo, Conacaste, and Espíritu Santo (with San Juan as the reference village).

Other attributes of the children that were controlled in the analysis included a set of dummy variables for the child's age in years and two measures of migration to control for the potential selectivity of those who moved into or out of the study villages over the period. The first was a measure for being an *in-migrant*, or whether an age-eligible child observed in the 1975, 1987, 1996, or 2002 census was not observed in the prior census round, including a 1967 census with individual-level information but only incomplete schooling. The second was a measure for being an *out-migrant*, or whether an age-eligible child in the 1975, 1987, or 1996 census was not observed in the subsequent census round.⁹

Analysis

To examine the associations of parental and village resources with children's schooling outcomes from 1975 to 2002, we estimated the linear relation (1), below, where S_{iht} denotes the schooling indicator of child i residing in household h observed at time t , I_{iht} a vector of personal characteristics of child i , H_{iht} a vector of parental and household characteristics of child i at age 7 years, V_{iht} a vector of village-level characteristics specific to child i and village dummies, β_t coefficients to be estimated (with superscripts c referring to the constant, I to individual-level, H to household-level, and V to village-level variables), and ε_{iht} a white noise disturbance term:

$$S_{iht} = \beta_t^c + I_{iht}\beta_t^I + H_{iht}\beta_t^H + V_{iht}\beta_t^V + \varepsilon_{iht} \quad (1)$$

This specification (Model 1, referred to as the “main-effects” model in Tables 3, 4, 5, and 6) is estimated separately for boys and girls and for the ages 7–12 and 13–17 years. Models for all three outcomes are fitted using OLS regression.¹⁰ Robust standard errors are estimated to account for the clustering of children within families.

⁸In an environment such as this characterized by deficient public resources for schooling, indicators such as teachers per grade and grades offered are likely to be critical determinants of schooling. We considered other village-level measures for social investments in school quality, such as the student–teacher ratio. Yet, this measure is less likely to have been measured well and was never significant in our analyses.

⁹We also assessed the potential influence of migration on our estimates by limiting the sample of older children to those 13–15 years. The results, which are available upon request, corroborate those for children 13–17 years, suggesting that selection is not substantially affecting the results.

¹⁰We estimated linear probability models for the binary indicator ever-schooling due to the loss of observations for “perfect prediction” when we estimated probit models with interactions between census year and other variables. This problem can arise when the right-side variables define many subgroups. So, OLS was considered the preferred estimation strategy; the results are qualitatively similar to those derived from probit estimations.

To assess whether associations of parental resources with children's schooling outcomes change over time, we added interaction terms between variables in H (maternal schooling, paternal schooling, and household standard of living) and a dummy variable for each census year (1987, 1996, 2002) but one (1975) (Model 2).¹¹ In these models, which we refer to as “census-interaction” models, we also include interactions of the three census dummy variables with all of the individual-level variables. We report F tests for the joint significance of sets of interaction terms for each parental resource variable and the census-year dummies (e.g., maternal schooling-by-census year dummy interactions).

Changes in Children's Schooling Outcomes, 1975–2002

In Table 1, we summarize the three measures of schooling achievements, separately for boys and girls by age (7–17, 7–12, and 13–17 years) for 1975 and 2002. Several patterns are notable. First, levels of schooling were universally low in 1975. Among children 13–17 years, for example, only about two-thirds had ever attended school, the average progression ratio was about 0.30, and the average schooling attainment was about 2.5 grades.

Second, there is almost no evidence of large or significant gender gaps in schooling in 1975, which may reflect in part the low levels of achievement at that time. For children 7–17 years, none of the three indicators for schooling differed significantly by gender. Within age groups, a slight advantage for girls was apparent at the younger ages (7–12 years), with girls marginally more often than boys ever attending school (0.47 vs 0.38) and completing a marginally higher number of grades (1.03 vs 0.82). These small gaps favoring young girls, however, were not present among the 13–17 year-olds, where boys and girls performed comparably for all three indicators of schooling achievement.

Third, between 1975 and 2002, there were large and significant increases in all three measures of achievements in schooling. For boys and girls 7–17 years, for example, the proportions who had ever attended school increased by more than half (from about 0.50 in 1975 to above 0.80 in 2002), the progression ratios more than doubled (from 0.26 to 0.57), and the average schooling attainment more than doubled (from about 1.50 grades to about 3.30 grades).

Fourth, significant gender gaps in schooling were apparent in 2002, favoring girls slightly at the younger ages and favoring boys at the older ages, a pattern consistent with girls starting and leaving school earlier. Among children 7–12 years, similar proportions of girls and boys had ever attended school (0.76 and 0.72), girls had a significantly (albeit modestly) higher schooling progression ratio than did boys (0.53 vs 0.48), and grade attainments were similar for girls and boys (1.93 and 1.86 grades). Among 13–17 year-olds, girls and boys did not differ with respect to ever attendance (0.93 vs 0.96), but boys had a significantly higher schooling progression ratio than did girls (0.69 vs 0.63), with the result that boys' grade attainment was nearly half a grade higher than that of girls (5.77 vs 5.31).

Changes in Parental Resources and Social Investments in Children, 1975–2002

Table 2 summarizes the parental resources to which children were exposed at age 7 years for boys and girls who were 7–12 and 13–17 years in 1975 and 2002. Levels of parental schooling were very low in 1975. In that year, children 7–17 years had mothers with less than one grade of schooling, on average, and had fathers with an average of 1.0 grades of schooling. By 2002, however, levels of maternal and paternal schooling had increased

¹¹We also include, but do not report, interactions of census year with missing parental resource variables, the migration indicators, and the individual age dummies. We tested interactions with other variables in H (such as living in a two-parent household) but these interactions were rarely significant, and so were not controlled for in the results presented.

markedly. Among children 7–12 years, maternal schooling had increased from 0.9–1.0 grades in 1975 to 2.9–3.1 grades in 2002, and paternal schooling had increased from 1.0–1.1 grades in 1975 to 3.7–3.8 grades in 2002. Yet, even in 2002, the levels of parental schooling were low compared with similar cohorts in other countries in Latin America.¹² Finally, between 1975 and 2002, the household standard of living score to which children were exposed at age 7 had increased significantly by about four standard deviations for girls and for boys of all ages. This change reflects improved housing conditions and increased ownership of consumer durable goods.

Table 2 also summarizes the village-level resources to which children were exposed at the age of 7 years for boys and girls 7–12 and 13–17 years in 1975 and 2002. First, the average number of teachers per grade of primary school increased significantly between 1975 and 2002 for all children. In 1975, for example, there were between 0.4 and 0.5 teachers per grade for children 7–17 years, and by 2002, there were between 1.1 and 1.3 teachers per grade. (A value of less than one for “teachers per grade” indicates that a single teacher was responsible for more than one grade, for example, in a combined grade classroom.) Second, for children 7–17 years in 1975, a full course of primary school (6 years) had not been offered in the villages throughout their lives, but by 2002, a full course of primary school had been offered during the 5 years before all children 7–17 years had turned age 7 years.

Third, children's years of exposure to an all-weather access road that led to a paved highway were very low in 1975, but had increased markedly and significantly between 1975 and 2002. In 1975, for example, children 13–17 years had only 1.6–2.0 years of exposure to an all-weather access road before turning 7 years, but by 2002, 13–17 year-olds had 10.2–11.3 years of exposure to an all-weather access road before turning 7 years.

Fourth, the percentage of adults working in wage labor was very low in 1975, but this percentage increased significantly between 1975 and 2002. In 1975, children 7–17 years had been living at the age of 7 years in a setting in which 12 % of adults were working in wage labor. By 2002, children 13–17 years had been living at the age of 7 years in an environment in which over 25 % of adults were working for a wage, and children 7–12 years had been living at the age of 7 years in a setting in which over 29 % of adults were working for a wage. Together, the evidence presented above suggests that boys and girls 7–17 years in these study villages had experienced dramatic increases in parental, household, and village resources during the period 1975–2002.¹³

Temporal Changes in the Association of Parental Resources and Children's Schooling Outcomes

Tables 3 and 4 show (1) “main-effects” and (2) “census-interaction” models for the determinants of ever schooling, schooling progression ratios, and total grades attained for girls and boys who were 7–12 years and resident during any of the four census rounds. For girls and boys, maternal grades of schooling, paternal grades of schooling, and the score for household standard of living were consistently positively associated with all three schooling outcomes, as shown in the main-effects models in Tables 3 and 4.¹⁴ For girls and boys, the average number of primary grades taught and the percentage of adults in wage labor were, in

¹²Estimates for maternal and paternal grade attainment in both census years are based on cases with the relevant data. Although the share of children with missing data on paternal schooling is higher than the share of children with missing data on maternal schooling for all ages, census years, and genders, the share of children with missing data on maternal and paternal schooling does not vary significantly either by the child's gender (within census years) or over time (within the child's gender).

¹³Because the distributions of boys and girls 7–12 and 13–17 years did not differ across study villages, there were no significant differences by child's gender in any of the indicators for parental or village resources in either 1975 or 2002.

¹⁴As in lower-income settings, the association of maternal schooling with children's schooling outcomes was stronger than that of paternal schooling, but significantly so only for the progression ratio and grades attained for girls (results available upon request).

most cases, positively associated with all schooling outcomes (main-effects models). Compared to girls in San Juan, girls in Santo Domingo had consistently poorer schooling outcomes. This pattern of schooling achievement by village was similar, but not statistically significant, for boys.

For girls 7–12 years (Table 3), neither set of interactions between the dummy variables for census years and either maternal schooling or paternal schooling were jointly significant in any of the census-interaction models (see p values for F tests, bottom of Table 3). Yet, interactions between the dummy variables for census years and the household standard of living score were jointly significant in all census-interaction models (see p values for F tests), and all of the estimated interaction effects were negative. Thus, controlling for secular trends in schooling achievements by including dummy variables for census years, age-period cohort changes in schooling achievements, and a range of village-level attributes, maternal and paternal schooling were significantly positively associated with all schooling outcomes in girls, and the magnitudes of these associations did not change over time. Yet, the magnitudes of the positive associations of household standard of living with girls' ever schooling, school progression ratios, and grade attainment diminished over time. In 1975, for example, a one standard deviation increase in the score for household standard of living was associated with the increase of ~ 0.12 in the probability of ever attending school and the schooling progression ratio as well as an increase of ~ 0.42 in grades of schooling. Yet, in 2002, a similar increase in the score for household standard of living was associated with the increase of only ~ 0.05 in the probability of ever attending school, ~ 0.06 in the schooling progression ratio, and ~ 0.16 in grades of schooling.

For boys 7–12 years (Table 4), no sets of interactions between the dummy variables for census years and either maternal schooling or paternal schooling were jointly significant in any of the census-interaction models (see p values for F tests). The census interactions with household standard of living were significant and negative for two census years (1987 and 1996) in the model for grades attained. Thus, controlling for secular trends in schooling achievements, age-period cohort changes in schooling achievements, and various village-level attributes, maternal and paternal schooling, and household standard of living were significantly positively associated with all schooling outcomes in boys, and these associations remained fairly constant over time. The declining association of household standard of living with boys' grades attained warrants clarification. In 1975, an increase of one standard deviation in the score for household standard of living was associated with increases of ~ 0.06 in the probability of ever attending school, ~ 0.07 in the schooling progression ratio, and ~ 0.25 in grades of schooling. By 2002, a similar increase in the score for household standard of living was associated with corresponding increases of only ~ 0.03 , ~ 0.03 , and ~ 0.12 in these outcomes. Comparing the results across Tables 3 and 4, the associations of parental resources (especially household standard of living) with schooling outcomes had become more similar for young girls and boys by 2002 because the stronger associations for girls in 1975 had declined more rapidly than those for boys.

Tables 5 and 6 show main-effects and census-interaction models for the same outcomes for girls and boys 13–17 years. For girls and boys, maternal grades of schooling, paternal grades of schooling, and the score for household standard of living were positively associated with all the three schooling outcomes in all main-effects models in Tables 5 and 6). In these models, the only village-level attribute associated with schooling outcomes for girls and boys was the years of exposure to an all-weather access road; for both groups, it was negatively associated with schooling outcomes. This negative association could have resulted from enhanced access to work opportunities outside of the villages. In addition, for boys, the average number of teachers per grade and the average number of grades offered were positively associated with at least two of the three schooling outcomes. The percentage

in the wage labor market was negatively associated with boys' ever schooling and schooling progression, perhaps because of the higher opportunity cost of schooling in an environment with more opportunities for wage labor.

For girls 13–17 years (Table 5), no sets of interactions between census year and parental resources were jointly significant (at $p < 0.05$) across all census-interaction models (see p values for F tests). Yet, the interactions of maternal schooling and census year were at least marginally jointly significant across all interaction models. Namely, an increase of one grade in maternal schooling in 1975 was associated with the increase of 0.09, 0.06, and 0.51, respectively, in the probability of attending school, the schooling progression ratio, and grades attained, compared to the corresponding increase of 0.01, 0.02, and 0.17 in 2002. Thus, controlling for secular trends in schooling achievements, age-period cohort changes in schooling achievements, and various village-level attributes, maternal schooling was positively associated with all schooling outcomes of older girls in 1975, but the magnitudes of these associations, while still positive, had diminished by 2002. In 1975, paternal schooling and the household's standard of living were positively associated with some schooling outcomes in older girls, and by 2002, these associations were, in most cases, similar in magnitude (census-interaction models, Table 5).

For boys 13–17 years (Table 6), the interactions between census year and measures of parental schooling were either never jointly significant (paternal schooling) or not consistently jointly significant (maternal schooling) across models for schooling outcomes. The interactions of census year and household standard of living, however, were jointly significant and negative across all interaction models (see F tests). Thus, among older boys in 1975, parental resources were positively associated with some (paternal schooling) or all (maternal schooling, household standard of living) schooling outcomes. While the magnitudes of the associations of maternal and paternal schooling with older boys' schooling remained similar over time, the magnitudes of the associations of household standard of living with boys' schooling outcomes diminished: in 1975, an increase of one standard deviation in the score for household standard of living was associated with increases of ~ 0.17 in the probability of ever schooling, ~ 0.12 in the school progression ratio, and ~ 1.30 grades attained; whereas, in 2002, such an increase in the score for household standard of living was associated, respectively, with the increase of 0.02, 0.04, and 0.28 in these outcomes. Thus, by 2002, the associations of parental resources with schooling outcomes in older children had become more gender equitable because the historically stronger associations of maternal schooling with girls' schooling and of household standard of living with boys' schooling had declined to the levels of association observed in the other gender.

Discussion and Conclusions

This paper has assessed to what extent associations of parental resources with the schooling outcomes of boys and girls change over time in the context of significant changes in direct social investments in children (e.g., the expansion of primary school opportunities) and in the economic environment (e.g., the increasing percentage of adults in wage labor) in which parents make decisions about their children's schooling. A major strength and contribution of this work is that it draws on a dataset that includes information on children's schooling, parental resources, and village histories for a 27-year period (1975–2002).

Levels of schooling in 1975 were similarly low for boys and girls 7–17 years, although among 7–12 year-olds, modest but significant gender gaps favoring girls in ever schooling and grade attainment were apparent. Between 1975 and 2002, large and highly significant increases were apparent for boys and girls in ever schooling, schooling progression, and grade attainment. By 2002, the modest gender gaps in schooling favoring girls at younger

ages had largely disappeared, and significant gender gaps in grade progression and attainment favoring boys at older ages (13–17 years) had emerged. The greater gains in schooling attainment for older boys than older girls appear to have resulted in part from boys' higher progression ratios (e.g., lower rates of dropout). The emergence in this period of a gap in grade attainment of almost 0.5 grades favoring boys contrasts the concurrent experiences of most other countries in Latin America (Behrman et al. 1999), where reversals in gender gaps in schooling toward favoring girls were observed as overall achievements in schooling improved. Although we cannot extrapolate from the observed trends in schooling in our four-village sample to all of Guatemala, the trends observed in our study villages corroborate national trends in similar measures for the same period, which suggest that participation in secondary education still favors Guatemalan boys over girls (World Bank 2012). The divergent trends in Guatemala, as compared to other LAC countries, may result from Guatemala's lower overall level of schooling in 1975, which offered less room for gender gaps in the past. As levels of schooling have increased, gender gaps in schooling have been able to emerge. Thus, trends in schooling in Guatemala may be lagging behind the regional tendency toward a disappearance or reversal of these gender gaps. As changes in public educational investments and schooling achievements continue, policy makers may consider the careful monitoring of gender gaps in schooling retention at the higher levels and, as needed, the targeted provision of demand-side incentives to encourage parents to keep their daughters in school (Lomelí 2008). For example, the Guatemalan government's scholarship for girls program ceased in 2008 but was estimated to be more cost effective per additional child graduated from primary school than the more recent conditional cash transfer program, *Mi Familia Progres*a (Benavides 2012). Programs like the scholarship for girls might be revisited.

Consistent with the model proposed by Haveman and Wolfe (1995), results of our multivariate analyses suggest that associations of parental resources with children's schooling outcomes tend to decline in strength over time (as seen in three of the four age-gender groups), and implicitly with increases in various social investments. Specific findings for younger and older children directly inform our research questions.

First, in 1975, positive associations of household standard of living with measures of ever schooling, schooling progression, and attainment were significant for girls and boys 7–12 years. These associations were marginally stronger for girls than boys in 1975, and declined over time only for girls. This finding corroborates the idea that, in lower-income settings with weak public infrastructures and safety nets, families are the main financiers of children's schooling, and investments in girls' primary schooling are a relative luxury because boys often provide financial support to their parents, for example in old age. In this environment, increases in a household's standard of living may be associated with greater increases in girls' schooling because wealthier parents are less dependent on (old-age) support and are freer to invest more equitably in their children. However, as the community or government begins to invest more in the schooling of children (e.g., as local primary schools are expanded to provide all 6 grades), the costs of schooling to families may diminish or the supply and quality of schooling increase, and the association between household standard of living and young girls' schooling declines to the level observed among young boys.

Second, in 1975, positive associations of maternal schooling with measures of schooling progression and attainment are significant for girls and boys 13–17 years, but these associations are stronger for girls in 1975, and decline over time only for girls. This tendency for the positive associations of maternal schooling to decline only for girls and to levels in 2002 that are comparable to those for boys corroborates the idea that, in lower-income settings in which schooling is largely financed by families, same-sex preference in

the allocation of resources to children (e.g., mother-to-daughter) may be apparent (Irwin et al. 1978). As public infrastructures for schooling expand and reduce the private costs of educating all children, the mother's role in promoting investments in her daughters may diminish. However, while associations of parental schooling with schooling outcomes among boys 13–17 years are robust to changing social investments in children's schooling, the association of household standard of living with their schooling outcomes declines in importance over time. This pattern, also consistent with Haveman and Wolfe (1995), partly offset the potential increases in gender schooling gaps that might have accrued with the declining role of maternal education for older girls' schooling.

To illustrate the net implications of declines in the associations of parental resources with children's schooling outcomes, we used the full main-effects and census-interaction models for grade attainment in Tables 5 and 6 to estimate what schooling attainments *would have been* in 2002 with constant versus declining associations of parental resources with grades of schooling for girls and boys aged 17 years old who were permanent residents in Espiritu Santu and holding all parental and village resource variables at their mean levels (Table 2). These calculations reveal that girls would have achieved 7.5 instead of 6.3 grades of schooling, and boys would have achieved 8.9 instead of 8.1 grades of schooling. These gaps illustrate the importance of considering how the association of parental resources and investments in children may change as broader socio-economic changes and social investments in schooling accrue. These gaps also suggest the potential importance of encouraging parents to invest in schooling as a joint measure to maximize the schooling achievements of girls and boys.

A limitation of our analysis is that this dataset lacks the information that would have allowed us to treat social and parental investments in children as behaviorally determined, or endogenous. Controlling for the endogeneity of parental schooling attainment can alter the estimated “impacts” of those parental resource variables (Behrman and Rosenzweig 2002, 2005; Black et al. 2005; Plug 2004). Although we did not have the data at hand to use the estimation methods such as instrumental variables that would have permitted us to estimate coefficients for the causal relationship of parental and community resources with children's schooling achievements, we were able to control for a large number of factors including fixed differences across villages and over time. Our analysis included specifically binary dummy-variable controls for each census year (and the regressions were estimated separately by age and gender of the children). These dummy variables captured the effects of all fixed aspects of the economy that may have affected schooling decisions and were common to individuals in that year, including the rate of return to education. If any remaining endogeneity biases that affected these estimated coefficients did not change over time, then observed differences across census years in the coefficients for parental resource may reflect changes over time in the causal component of the parental resource variables. This assumption, however, may be too strong, because the preferences of parents to invest in their children's schooling can change over time, or households may respond differentially to macro-economic changes that affect the returns to schooling for girls and boys. In light of these limitations, we explored changes in the associations of selected parental resources with children's schooling outcomes in multivariate models that controlled for secular trends in schooling, cohort-period trends in schooling, and various fixed community characteristics.

Given these limitations, some caution is warranted in considering the implications of our findings for policy. Still, our findings at least corroborate the idea that the roles of parental and household resources for children's schooling achievements change with secular changes in parts of rural Guatemala. Specifically, parental resources appear to become more weakly associated with children's attendance, progression, and attainment and to become more equitably associated with boys' and girls' schooling outcomes. However, our findings for

older children also suggest that boys may benefit substantially from public investments in schooling (Table 6), while the associations of parental resources with boys' schooling either remain stable (parental schooling) or decline to the levels that are sustained over time for girls (household standard of living). Such findings suggest, again, the potential need for monitoring gender gaps in schooling retention at the higher levels, to consider supply-side initiatives that attract boys and girls at equal rates to higher schooling, or to consider demand-side incentives to keep girls in school at the higher grade levels. The potential interactions of parental resources and the broader social environment also should be considered in the design and implementation of policies to influence children's schooling or the available resources that parents have to invest in their children. In short, one-size-fits-all policies may be inappropriate if they overlook the possibility of differential access to social investments in schooling and the potential impacts of these investments on the parental resource investments in children's schooling.

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Table 1
Schooling achievements in the INCAP study villages, by gender, age, and census year

Age group in years	1975		2002		Boys proportion (n)	Girls proportion (n)	Boys proportion (n)	Girls proportion (n)	p $P_{B75} - P_{G75}$	p $P_{B02} - P_{G02}$	p^a $P_{G02} - P_{G75}$	p^b $P_{G02} - P_{B75}$	
	Boys proportion (n)	Girls proportion (n)	Boys proportion (n)	Girls proportion (n)									
Ever schooling													
7-17	0.52 (461)	0.50 (470)		0.83 (897)		0.82 (986)				**		**	
7-12	0.47 (310)	0.38 (278)		0.76 (557)	*	0.72 (564)				**		**	
13-17	0.64 (151)	0.67 (192)		0.93 (340)		0.96 (422)				**		**	
Grade progression													
7-17	0.26 (461)	0.26 (470)		0.57 (897)		0.57 (986)				**		**	
7-12	0.25 (310)	0.21 (278)		0.53 (557)		0.49 (564)	**			**		**	
13-17	0.29 (151)	0.32 (192)		0.63 (340)		0.69 (422)	**			**		**	
Schooling attainment													
7-17	1.50 (461)	1.57 (470)		3.21 (897)		3.53 (986)	**			**		**	
7-12	1.03 (310)	0.82 (278)		1.93 (557)	*	1.86 (564)				**		**	
13-17	2.45 (151)	2.65 (192)		5.31 (340)		5.77 (422)	*			**		**	

Sample sizes are in parentheses

^a T test for difference in schooling outcomes for girls in 1975 versus girls in 2002

^b T test for difference in schooling outcomes for boys in 1975 versus boys in 2002

* p 0.05;

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Table 2

(n)	7-12 years				13-17 years			
	1975		2002		1975		2002	
	Girls (310)	Boys (278)	p	Girls (557)	Boys (564)	p	$p^a_{G_{02}} - B_{75}$	$p^b_{B_{02}} - B_{75}$
Child Characteristics								
Age in years	9.42	9.19		9.31	9.38		14.87	14.82
Parental resources at child's age 7 years								
Maternal grades of schooling	0.91	1.01		3.10	2.92		0.84	0.94
Paternal grades of schooling	1.04	1.08		3.80	3.71		0.93	0.98
Household standard of living score (HSOL)	-2.73	-2.64		1.82	1.72		-2.98	-3.01
Two parent co-resident	73.55	67.27		69.66	67.91		63.58	63.54
Village investments at child's age 7 years								
Avg. teachers per grade, 5 years prior	0.42	0.43		1.27	1.26		0.48	0.47
Avg. number of grades, 5 years prior	5.09	5.11		6.00	6.00		3.97	4.00
Years of exposure to an all-weather access road	2.82	2.47		13.95	14.76		1.64	1.99
Percent in wage labor	12.11	11.67		29.14	29.15		12.10	12.66

^a *T* test for difference in parental resources and village investments for girls in 1975 versus girls in 2002.^b *T*-test for difference in parental resources and village investments for boys in 1975 versus boys in 2002 $p^* \quad 0.05;$

p 0.01

Table 3
Determinants of ever schooling, school progression, and grades attained, girls 7–12 years in INCAP study villages ($n = 1,679$)

Models	Ever schooling			Schooling progression ratio			Grades attained		
	Main-effects			Census-interaction			Main-effects		
	<i>b</i>	<i>p</i>	(se)	<i>b</i>	<i>p</i>	(se)	<i>b</i>	<i>p</i>	(se)
Constant	−0.956	**	(0.202)	−0.642	**	(0.240)	−0.587	**	(0.152)
Parental resources at child's age 7									
Maternal grades	0.024	**	(0.005)	0.029		(0.017)	0.033	**	(0.004)
Paternal grades	0.018	**	(0.004)	0.023		(0.015)	0.019	**	(0.004)
Two parents co-resident	−0.011		(0.025)	0.000		(0.026)	−0.011		(0.021)
HSOL	0.050	**	(0.006)	0.117	**	(0.023)	0.052	**	(0.005)
Village investments at child's age 7									
Avg. teachers per grade, 5 years prior	0.438	**	(0.122)	0.405	**	(0.139)	0.162		(0.095)
Avg. number of grades, 5 years prior	0.151	**	(0.035)	0.145	**	(0.037)	0.104	**	(0.026)
Yrs exposure to all-weather access road	−0.007	*	(0.003)	−0.007		(0.004)	−0.004		(0.003)
Percent in wage labor	0.007	*	(0.003)	0.007		(0.004)	0.010	**	(0.003)
Interactions with census year									
Maternal grades * 1987				0.024		(0.021)			(0.018)
Maternal grades * 1996				−0.017		(0.019)			(0.017)
Maternal grades * 2002				−0.010		(0.018)			(0.016)
Paternal grades * 1987				0.005		(0.017)			(0.012)
Paternal grades * 1996				−0.001		(0.016)			(0.012)
Paternal grades * 2002				−0.014		(0.016)			(0.011)
HSOL * 1987				−0.065	*	(0.026)		**	(0.019)
HSOL * 1996				−0.077	**	(0.025)		**	(0.019)
HSOL * 2002				−0.072	**	(0.025)		**	(0.020)
$R(>F)$ for census year interactions with:									
Maternal grades	0.061	+		0.561					
							−0.789	**	(0.569)
							0.144	**	(0.051)
							0.030	**	(0.035)
							0.009		(0.073)
							0.417	**	(0.060)
							0.829	*	(0.364)
							0.241	*	(0.094)
							−0.013		(0.010)
							0.032	**	(0.010)
							−0.005		(0.060)
							−0.037		(0.057)
							−0.041		(0.054)
							0.072		(0.044)
							0.038		(0.042)
							0.018		(0.039)
							−0.306	**	(0.067)
							−0.248	**	(0.068)
							−0.259	**	(0.066)

Models	Ever schooling			Schooling progression ratio						Grades attained					
	Main-effects			Census-interaction			Main-effects			Main-effects			Census-interaction		
	b	p	(se)	b	p	(se)	b	p	(se)	b	p	(se)	b	p	(se)
Paternal grades				0.316									0.301		
HSOL				0.021	*					0.352			0.000	**	

Models also control for child's age, maternal schooling missing, paternal schooling missing, household standard of living score missing, being an immigrant, being an outmigrant, village, and census year, as well as interactions between child's age and census year, being an immigrant and census year, and being an outmigrant and census year (results available on request)

+ p 0.10;
* p 0.05;
** p 0.01

Table 4

Models	Ever schooling						Schooling progression ratio						Grades attained					
	Main-effects			Census-interaction			Main-effects			Census-interaction			Main-effects			Census-interaction		
	b	p	(se)	b	p	(se)	b	p	(se)	b	p	(se)	b	p	(se)	b	p	(se)
Constant	-0.575	**	(0.205)	-0.404		(0.256)	-0.359	*	(0.153)	-0.199		(0.190)	-1.543	**	(0.545)	-0.902		(0.628)
Parental resources at child's age 7																		
Maternal grades	0.025	**	(0.004)	0.049	*	(0.021)	0.029	**	(0.004)	0.031	*	(0.015)	0.089	**	(0.013)	0.105	*	(0.048)
Paternal grades	0.019	**	(0.004)	0.039	*	(0.016)	0.021	**	(0.004)	0.038	*	(0.015)	0.066	**	(0.012)	0.114	**	(0.042)
Two parents co-resident	-0.009		(0.022)	-0.009		(0.023)	-0.001		(0.018)	0.002		(0.018)	-0.023		(0.066)	0.000		(0.067)
HSOL	0.038	**	(0.006)	0.063	*	(0.026)	0.035	**	(0.005)	0.074	**	(0.021)	0.107	**	(0.018)	0.248	**	(0.063)
Village investments at child's age 7																		
Avg. teachers per grade, 5 years prior	0.011		(0.108)	0.040		(0.128)	-0.115		(0.090)	-0.069		(0.104)	-0.280		(0.303)	0.241		(0.343)
Avg. number of grades, 5 years prior	0.093	**	(0.036)	0.075		(0.039)	0.069	**	(0.026)	0.062	*	(0.027)	0.205	*	(0.092)	0.166		(0.096)
Yrs exposure to all-weather access road	-0.006		(0.003)	-0.006		(0.003)	-0.002		(0.003)	-0.001		(0.003)	-0.022	*	(0.009)	-0.010		(0.010)
Percent in wage labor	0.012	**	(0.003)	0.012	**	(0.003)	0.012	**	(0.003)	0.014	**	(0.003)	0.019	*	(0.009)	0.031	**	(0.010)
Interactions with census year																		
Maternal grades * 1987				-0.004		(0.024)				0.002		(0.017)				0.000		(0.059)
Maternal grades * 1996				-0.026		(0.022)				0.001		(0.016)				-0.004		(0.053)
Maternal grades * 2002				-0.032		(0.022)				-0.007		(0.016)				-0.034		(0.052)
Paternal grades * 1987				-0.016		(0.018)				-0.019		(0.017)				-0.052		(0.050)
Paternal grades * 1996				-0.019		(0.017)				-0.016		(0.016)				-0.044		(0.046)
Paternal grades * 2002				-0.023		(0.017)				-0.018		(0.016)				-0.058		(0.046)
HSOL * 1987				-0.021		(0.028)				-0.043		(0.022)				-0.146	*	(0.071)
HSOL * 1996				-0.028		(0.028)				-0.039		(0.022)				-0.156	*	(0.068)
HSOL * 2002				-0.034		(0.029)				-0.042		(0.023)				-0.133		(0.069)
$P(>F)$ for census year interaction with:																		
Maternal grades				0.113						0.845						0.695		
Paternal grades				0.589						0.696						0.642		

0.148
$$\begin{array}{c} * \\ p \end{array} \quad \begin{array}{c} 0.05; \\ \\ 0.01 \end{array}$$

Table 5
Determinants of ever schooling, school progression, and grades attained, girls 13–17 years in INCAP study villages ($n = 1,110$)

Models	Ever schooling			Schooling progression ration						Grades attained					
	Main-effects			Census-interaction			Main-effects			Census-interaction			Main-effects		
	<i>b</i>	<i>P</i>	(se)	<i>b</i>	<i>p</i>	(se)	<i>b</i>	<i>p</i>	(se)	<i>b</i>	<i>p</i>	(se)	<i>b</i>	<i>p</i>	(se)
Constant	0.428		(0.441)	0.764		(0.584)	0.306		(0.250)	0.342		(0.316)	0.882		(2.157)
Parental resources at child's age 7															(2.748)
Maternal grades	0.020	**	(0.004)	0.085	**	(0.024)	0.031	**	(0.004)	0.061	**	(0.015)	0.252	**	(0.035)
Paternal grades	0.016	**	(0.004)	-0.002		(0.024)	0.024	**	(0.003)	-0.006		(0.013)	0.199	**	(0.028)
Two parents co-resident	0.016		(0.021)	0.014		(0.022)	-0.005		(0.018)	-0.004		(0.018)	-0.043		(0.146)
HSOL	0.020	**	(0.005)	0.071		(0.046)	0.037	**	(0.005)	0.066	**	(0.025)	0.302	**	(0.039)
Village investments at child's age 7														*	(0.203)
Avg. teachers per grade, 5 years prior	-0.025		(0.131)	-0.056		(0.141)	0.095		(0.107)	0.080		(0.114)	0.682		(0.879)
Avg. number of grades, 5 years prior	0.064		(0.109)	0.033		(0.134)	-0.003		(0.060)	0.010		(0.070)	0.223		(0.516)
Yrs exposure to all-weather access road	-0.006		(0.003)	-0.006		(0.003)	-0.008	**	(0.002)	-0.008	**	(0.002)	-0.062	**	(0.020)
Percent in wage labor	0.000		(0.003)	0.005		(0.004)	0.001		(0.003)	0.003		(0.003)	0.015		(0.023)
Interactions with census year															(0.026)
Maternal grades * 1987				-0.070	**	(0.026)				-0.021		(0.019)			(0.159)
Maternal grades * 1996				-0.066	**	(0.025)				-0.028		(0.016)			(0.138)
Maternal grades * 2002				-0.075	**	(0.024)				-0.040	*	(0.016)		*	(0.134)
Paternal grades * 1987				0.035		(0.026)				0.039	*	(0.016)		*	(0.130)
Paternal grades * 1996				0.012		(0.025)				0.031	*	(0.014)		*	(0.116)
Paternal grades * 2002				0.017		(0.025)				0.030	*	(0.015)		*	(0.119)
HSOL * 1987				-0.042		(0.048)				-0.032		(0.027)			(0.220)
HSOL * 1996				-0.051		(0.047)				-0.033		(0.026)			(0.213)
HSOL * 2002				-0.056		(0.046)				-0.028		(0.026)			(0.211)
$R(>F)$ for census year interactions with:															
Maternal grades				0.016	**					0.056	+			+	

Models	Ever schooling			Schooling progression ration			Grades attained		
	Main-effects			Census-interaction			Main-effects		
	b	P	(se)	b	p	(se)	b	p	(se)
Paternal grades									
				0.207					0.083 +
HSOL				0.546					0.648

Models also control for child's age, maternal schooling missing, paternal schooling missing, household standard of living score missing, being in immigrant, being an outmigrant, village, and census year, as well as interactions between child's age and census year, being an immigrant and census year, and being an outmigrant and census year (*results available on request*)

+ p 0.10;
* p 0.05;
** p 0.01

Table 6
Determinants of ever schooling, school progression, and grades attained, boys 13–17 years in INCAP study villages ($n = 1,330$)

Models	Ever schooling			Schooling progression ration			Grades attained		
	Main-effects			Main-effects			Main-effects		
	<i>b</i>	<i>P</i>	(se)	<i>b</i>	<i>P</i>	(se)	<i>b</i>	<i>P</i>	(se)
Constant	0.243		(0.293)	0.183		(0.390)	0.102		(0.212)
Parental resources at child's age 7				−0.131		(0.173)	−2.848		(1.463)
Maternal grades	0.009	*	(0.004)	0.042	*	(0.021)	0.025	**	(0.004)
Paternal grades	0.009	*	(0.004)	0.008		(0.020)	0.024	**	(0.004)
Two parents co-resident	0.004		(0.021)	0.003		(0.020)	0.003		(0.018)
HSOL	0.017	**	(0.005)	0.167	**	(0.035)	0.037	**	(0.005)
Village investments at child's age 7				0.183		(0.125)	0.197	*	(0.098)
Avg. teachers per grade, 5 years prior	0.255	*	(0.125)	0.174	*	(0.084)	0.091	*	(0.040)
Avg. number of grades, 5 years prior	0.081		(0.070)	−0.013	**	(0.003)	−0.010	**	(0.002)
Yrs exposure to all-weather access road	−0.011	**	(0.003)	−0.005		(0.003)	−0.003		(0.002)
Percent in wage labor	−0.007	**	(0.002)	−0.018		(0.024)	0.005		(0.016)
Interactions with census years				−0.037		(0.021)	0.004		(0.014)
Maternal grades * 1987				−0.044	*	(0.021)	−0.014		(0.013)
Maternal grades * 1996				0.004		(0.022)	0.009		(0.015)
Maternal grades * 2002				−0.003		(0.021)	−0.011		(0.015)
Paternal grades * 1987				0.002		(0.021)	−0.002		(0.015)
Paternal grades * 1996				−0.145	**	(0.037)	−0.082	**	(0.024)
Paternal grades * 2002				−0.160	**	(0.035)	−0.081	**	(0.023)
HSOL * 1987				−0.153	**	(0.036)	−0.081	**	(0.023)
HSOL * 1996									
HSOL * 2002									
$R(>F)$ for census year interactions with:									
Maternal grades				0.049	*		0.164		

Models	Ever schooling			Schooling progression ration						Grades attained					
	Main-effects			Census-interaction			Main-effects			Census-interaction			Main-effects		
	<i>b</i>	<i>P</i>	(se)	<i>b</i>	<i>P</i>	(se)	<i>b</i>	<i>P</i>	(se)	<i>b</i>	<i>P</i>	(se)	<i>b</i>	<i>P</i>	(se)
Paternal grades				0.826						0.252			0.367		
HSOL				0.001	**		0.004	**		0.003	**				

Models also control for child's age, maternal schooling missing, paternal schooling missing, household standard of living score missing, being an immigrant, being an outmigrant, village, and census year, as well as interactions between child's age and census year, being an immigrant and census year, and being an outmigrant and census year (results available on request)

* *p* 0.05;

** *p* 0.01