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The Effects of Peru's Push to Improve Education

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Peru's effort to expand public education from the mid-1950s to the 1960s has narrowed the educational gap between rural and urban residents, males and females — but male urban students are still likely to advance furthest in school. At the primary level, student achievement is greatly improved by such material inputs as desks and textbooks.

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From the mid-1950s to the 1960s, the government of Peru undertook a major expansion of public education, increasing the number of schools, requiring primary schools that offered an incomplete cycle to add grades, and increasing school inputs (principally teachers and textbooks).

The authors examine the effects of Peru's educational policies, and the effects of family background and community characteristics on the schooling levels of a sample of adults. Data on males and females were analyzed separately by birth cohort, using a sample of 5,644 females and 5,241 males aged 20 to 59.

The authors found that:

- The government's policy to expand the schools played a major role in raising education levels and narrowing the gap between rural and urban residents, and males and females.

- The impact of parents' years of schooling and occupations on the educational levels of their children lessened over time as the supply of schools expanded throughout the country — an indicator that the link between socioeconomic background and access to schools had weakened.

- The relative effect of parents' education differed for sons' and daughters' schooling. Fathers' education had twice as great an effect on sons' schooling as mothers' education; for daughters, both parents' education had equivalent, strong positive effects.

- Primary schools expanded rapidly even in rural areas, so rural residence did not adversely affect the primary schooling of males. Urban or rural residence did matter greatly for females, however, suggesting less desire by rural parents to invest in the schooling of their daughters.

- Urban residence at the age of 13 remained an important determinant of educational attainment because of the great disparity between urban and rural areas in availability of secondary schools.

- The availability of material school inputs, such as textbooks and desks at the primary level, had a large positive effect on final school levels.

This paper is a product of the Education and Employment Division, Population and Human Resources Department. Copies are available free from the World Bank, 1818 H Street NW, Washington DC 20433. Please contact Cynthia Cristobal, room S6-035, extension 33640.

Table of Contents

I. Introduction

Over the past few decades in Peru, expanding and improving the quality of public education have been important components of government strategies to accelerate economic development and redistribute income. Given the historically key role assigned to education, this study addresses the following questions: How rapidly have educational opportunities and schooling levels changed over time? In the process, have they become more equitably distributed? How have educational policies of past decades affected levels of educational attainment? What other factors (e.g., family background and community characteristics) explain observed variations in the levels of education among individuals and differences in those levels between males and females? Throughout the paper, the terms educational attainment and schooling levels are used interchangeably. Both are defined as the number of years of schooling completed.

The paper is organized as follows. The next section traces the expansion of education in Peru, relating it to changes in the economy and to educational reforms of recent decades. Section III reviews economic models of schooling choice, presents the empirical models estimated, and defines the variables used in the analysis. Section IV describes the sample, and Section V presents and discusses the findings of the study in light of educational change and development in Peru. Section VI presents some concluding remarks.

II. Trends In Education

Patterns and Trends

This section traces the growth of educational opportunities in Peru from 1940 through 1980 and describes the economic and educational policy contexts in which they occurred. Due to minimal data prior to 1950, most of the discussion pertains to the years 1950-1980. For these decades, educational trends are traced by quinquennia in order to capture the effects of different administrations' policies on levels of educational attainment. To provide a basis for explaining variations in adult educational attainment, each quinquennium is matched with the birth cohort whose educational experience most likely corresponds to that period.

Trends in Enrollment. In the early 1940s, schooling opportunities in Peru were quite limited. As a consequence, over one-half of all adults could neither read nor write (Appendix Table A.1);[1/] only one child in three enrolled in a primary or lower secondary school (Appendix Table A.2). Moreover, raising school attendance was particularly challenging. Two-thirds of all Peruvians were scattered in rural areas, and 35 percent of the population spoke only Quechua or Aymara, the two main Indian languages, while Spanish was the language of the schools (Censos Nacionales, 1981).

1/ By way of comparison, among Latin American countries, only El Salvador, Nicaragua, Honduras, Bolivia, Guatemala, and the Dominican Republic had higher illiteracy rates than Peru in the early 1940s (Drysdale and Meyers, 1975).

Since that time, educational opportunities have expanded considerably. Figures 1A-3B display the rapid rise in enrollments and gross enrollment ratios between 1950 and 1980. They show the following patterns: (1) Enrollment of males and females has increased steadily at all levels of education. (2) Male enrollment in primary school increased sooner than female enrollment. In 1950, male enrollment relative to the school-age population reached 100 percent, while that for females was 69 percent.[2/] At other levels of education, less of a differential between male and female enrollment is observed. Educational opportunities were still very limited for both sexes. (3) In primary education, females who would have been of school age during the late 1950s and throughout the 1960s (i.e. cohorts born between 1950 and 1964) increased their enrollment faster than other cohorts. As a result, female enrollment ratios rose from 65 percent in 1955 to 99 percent by 1970, which narrowed the differential between male and female enrollment. Males born between 1955 and 1964 show the largest enrollment increases. However, since males began the 1950s with already high rates of enrollment, their gains were far less dramatic than those achieved by females. (4) Not only were more Peruvians attending primary school in the 1960s, but a larger proportion were continuing on to secondary school. Relative to other cohorts, males and females born between 1950 and 1959 registered the largest proportional

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2/ Gross enrollment ratios are computed as the ratio of total enrollment to the population aged 6 to 11. When under- or over-age students are enrolled, owing to repetition, early or delayed entry, or re-entry, the ratio can exceed 100 percent. On the other hand, net enrollment ratios exclude over and under-aged youths. They are computed as the ratio of 6 to 11 year olds enrolled in school to the 6 to 11 year old population. To gauge how these two ratios differ, Peru's 1980 net enrollment ratio is reported at 85%, compared to a gross enrollment ratio of 115%. Therefore, in 1980 approximately 30% of all students were either under- or over-age but we do not know the share attributable to repetition, delayed or early entry, or re-entry.

Figure 1A
Enrollment in Primary School,
1960-1990

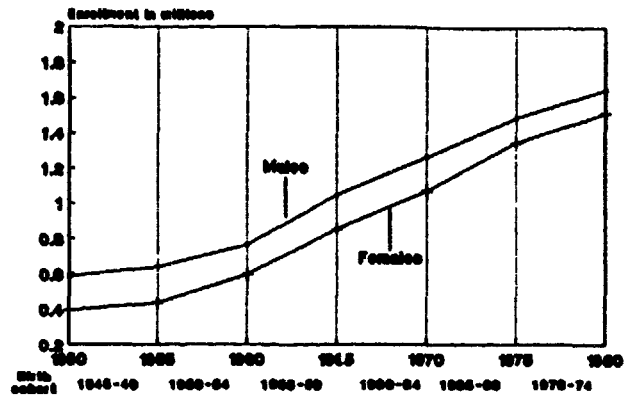


Figure 1B
Primary Enrollment as a Percent of
the Population 6-11 Years Old, 1960-1990

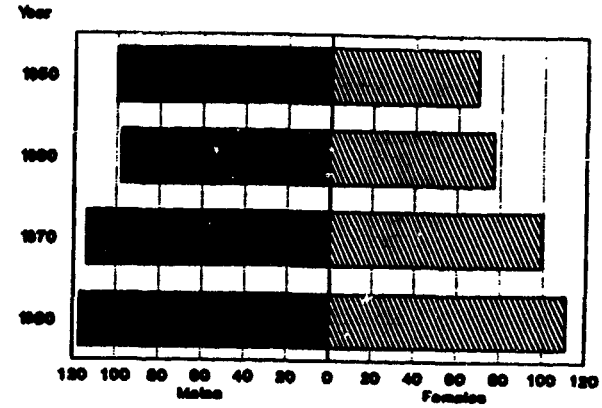


Figure 2A
Enrollment in Secondary School,
1960-1990

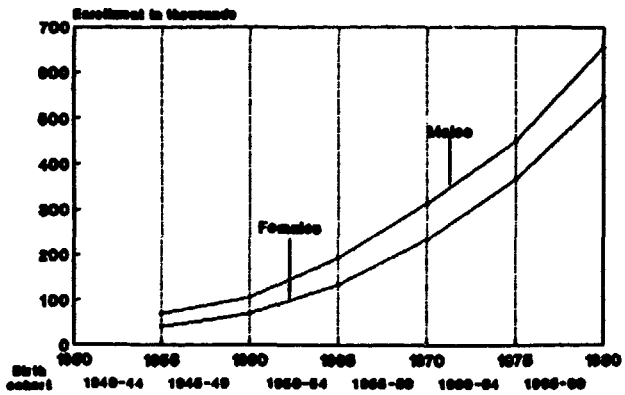


Figure 2B
Secondary Enrollment as a Percent of the
Population 12-17 Years Old, 1960-1990

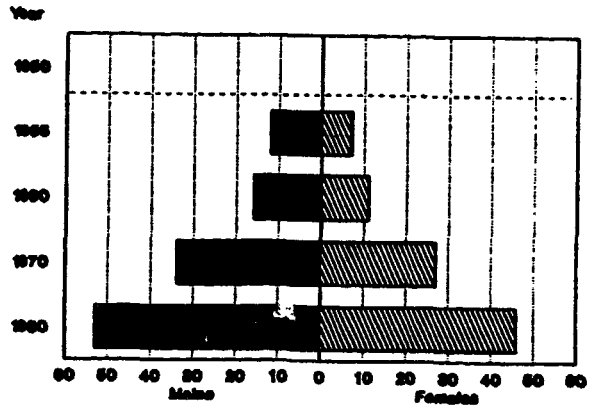


Figure 3A
Enrolment in Tertiary Institutions,
1960-1990

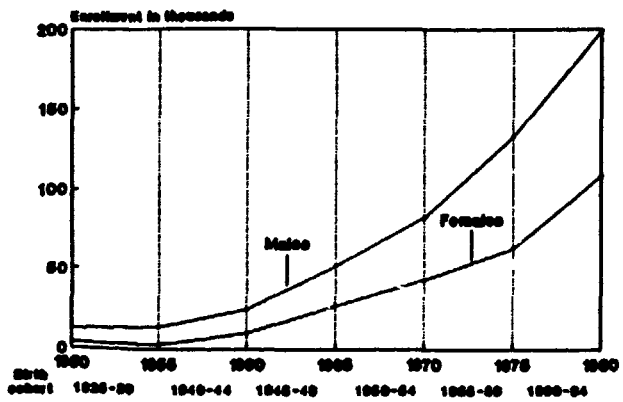
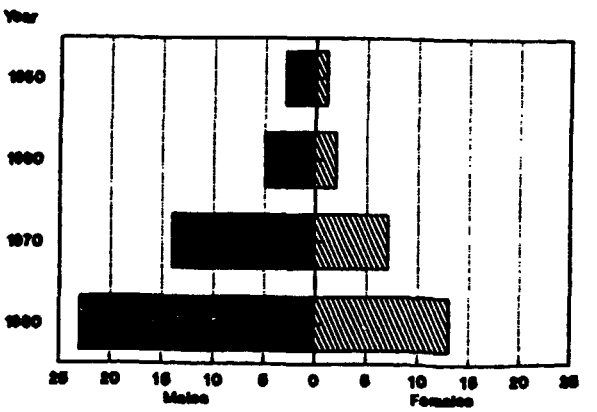


Figure 3B
Tertiary Enrollment as a Percent of the
Population 20-24 Years Old, 1960-1990



increases in secondary school participation. (5) In higher education, enrollment of males and females began a strong upward trend in 1960 that continued throughout the subsequent decade. But, the gap between the proportion of males and of females enrolled relative to their respective school-age populations widened.

Urban-Rural Patterns. Throughout the period of rapid expansion during the 50s and 60s, children in rural areas were less fortunate than those in urban areas, where many of the new school places were concentrated. In 1972, only 63% of rural children six to fourteen years old were enrolled in primary and lower secondary schools, compared to 90% of urban youths. Opportunities for upper secondary and tertiary education were rare in rural communities. Only 17% of rural youths aged 12-17 were enrolled in such schools, compared to 54% in urban areas (Appendix Table A.2). Since the early 70s, however, an increasing number of parents in rural areas have sent their children to primary and lower secondary school so that by 1981, the gap in participation rates between urban and rural children was 50 percent lower than it was in 1970. At the upper levels, rural residents made little progress. In 1981, only 24 percent of the relevant school-age population in rural areas attended an upper secondary or tertiary institution, compared to 63% of their urban counterparts.

Changes in Educational Attainment. Changes in the educational levels of adults mirror these enrollment expansion patterns. Average years of schooling of Peruvians aged 15 and above have increased steadily over time and the proportion who had never attended school dropped from 58% in 1940 to 16%

in 1981 (Appendix Table A.1). The strong growth in female enrollment in primary school during the 60s and the trend to continue on to secondary and higher education are particularly evident. The proportion of females who reported primary school as their highest level attended rose from 38 percent in 1960 to 42 percent in 1972; and by 1972, 24 and 18 percent of all males and females, respectively, had attended secondary school compared to 6 and 3 percent in 1940. By 1981, these proportions each rose by 10 percentage points reflecting comparable enrollment growth for males and females. A similar pattern is observed for higher education.

Educational Policy Context

The particularly strong upward trends observed during the 50s and 60s reflect the commitment of Presidents Prado (1956-1962) and Belaunde Terry (1963-1968) to expand public education. Under their administrations, schools, teachers, and government expenditures on education grew at unprecedented rates. Between 1955 and 1965, the number of primary schools rose from just 12,000 to 18,500 and the number of teachers nearly doubled (Appendix Table A.3). Higher education grew the fastest, offering not only more student places but also a wider variety of programs.[3/] The number of universities mushroomed from 9 in 1955 to 27 ten years later.

3/ Many new post-secondary non-university institutions known as "institutos de educacion tecnica superior" (IETS) were established to meet the demand for higher education that lead to a professional title and to provide an alternative to students unable to obtain admission to a university.

During these two administrations economic prospects were also bright,[4] and public resources were made increasingly available for education. The share of public expenditure allocated to education leaped from just 14% in 1950 to 23% in 1968, representing about 1.6% and 5% of GDP (Drysdale, 1975; World Bank, 1973). As a result of these investments, the proportion of Peruvian children enrolled in school relative to the size of the school-age population far exceeded participation rates in the average Latin American country.[5]

During the subsequent decade, the school system grew at a more moderate, but steady, pace under the leadership of Generals Velasco Alvarado (1968-1975) and Morales Bermudez (1975-1980). Between 1970 and 1980 only 1,500 new primary schools were opened. Enrollment increases levelled off at 3 and 8 percent a year in primary and secondary schools, respectively, and at 8 percent in post-secondary institutions (Appendix Table A.4). Public resources also became more constrained and less available for education as the economy

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[4] Growth in GDP was sustained at 5.5% per annum, reaching 7.2% between 1960-1965. (World Bank, 1985) Much of this growth resulted from policies promoting foreign and public investment in the manufacturing, mining and fisheries industries, particularly under Belaunde. As a result of these investment priorities, manufacturing replaced agriculture as the leading sector.

[5] Gross enrollment ratios for Peru reached 107, 34, and 10 percent in primary, secondary, and higher education respectively compared to 78, 19, and 3 percent for the region as a whole. (UNESCO, 1987) As explained in footnote 2, we do not know the proportion of over-age students attributable to repetition, delayed entry, or re-entry. The proportion of repeaters in primary school in Peru (about 15%) is comparable to the average Latin American country.

weakened.[6] By 1980, education's share of the public budget had fallen to 13 percent, representing 3.1% of GDP (Arregui, 1988).

Although the specific educational policies of Belaunde and Velasco differed, both targeted education as the key to economic development and income redistribution. Belaunde embarked on an ambitious program of school expansion to raise skill levels, and extend access to previously excluded groups. He directed his attention towards achieving universal primary education, expanding universities, and improving the quality of instruction. He instituted a law requiring all elementary schools to offer the complete cycle of education if enrollment would justify doing so, began experiments and research activities in bilingual education to attract and retain Indian children in primary schools, and awarded all primary school teachers a 25% nominal pay increase per year to attract and retain teachers for the expanding system.[7]

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[6] By the end of Velasco's tenure, inflation was running at 60% a year and a serious balance of payments problem was brewing. Export prices for Peru's primary export commodities plummeted resulting in a severe cutback in both public and private investment. Overall, economic performance throughout the 1970s was decidedly mediocre. GDP grew at 3.2% annually; per capita incomes stagnated; and unemployment rose (World Bank, 1985).

[7] These reforms took place within the traditional system of Peruvian education, where students followed a conventional ladder of 5 years each of primary and secondary schooling, followed by higher education. In secondary schools students chose between the general or technical streams. The former offered an academic curriculum with a specialization in humanities or the sciences during the last two years of the cycle. The technical stream offered 5 years of technical education with specializations in such areas as agriculture, business, electronics, etc. At the post-secondary level, vocational training was offered in technical, pedagogical, and other specialized institutes; courses were usually three or four years in length.

It is difficult to assess the accomplishments of Belaunde's policies since appropriate data from this period are scarce. However, the limited data we gathered from several sources suggest that Belaunde's education reforms did not proceed smoothly and were not entirely effective. The rapid increase in teachers salaries placed a drain on dwindling public resources. Moreover, disparities in educational services between urban and rural areas and the quality and efficiency of schools do not appear to have improved greatly. Most rural schools still only offered the first three grades of primary education, and secondary schools were virtually non-existent in rural areas. About one-half of all schools lacked equipment, teaching materials and furniture. Most of these schools were in rural areas (World Bank, 1983). Graduates of secondary schools had difficulty obtaining employment in areas for which they were trained (Paulston, 1972). Student-teacher ratios, however, do not appear to have worsened and students were staying in school longer. By 1968, about 60% of primary students dropped out by the fifth year, compared to 85% in 1943; and while only 4% of those enrolled in the first grade during the 50s completed secondary school, this figure rose to 12% during the 60s (Ministerio de Educacion, 1982; Paulston, 1972; Freeberger, 1965).

In response to these perceived educational deficiencies, Velasco made increasing educational opportunities of rural and Indian children a priority and perhaps had more success than Belaunde. Rather than building more schools, multigrade teaching was introduced in incomplete schools, and all schools, including private ones, were required to make their facilities available to the community for evening adult education programs. For

monolingual Quechua and Aymara speakers, a bilingual education program was instituted in many schools in the Sierra. More teaching materials were produced and textbooks were made less costly for parents. To lower repetition and drop out rates, an automatic promotion policy was instituted whereby promotion to the next grade depended on the completion of a given series of lessons. The most radical change Velasco introduced was restructuring the educational system so that everyone received the same elementary and secondary education, one which integrated practical and academic courses.[8/] This program was later continued, with only minor modifications, by Morales Bermudez.

Again, we have little information to evaluate the effectiveness of Velasco's policies. The data do suggest that a smaller proportion of students were repeating and dropping out. The proportion of primary school students who repeated fell from 17 to 10 percent between 1970 and 1975 and the proportion of first grade students who dropped out before reaching the final grade, although still high, fell to between 40 and 50 percent by 1981.

In summary, returning to the questions posed in the introduction, we conclude that educational opportunities in Peru have expanded considerably and steadily over time, leaping during the 60s. Educational policies during the past three decades appear to have made access to primary schooling more equitable, while secondary (particularly upper secondary) and higher education largely remained an urban advantage. In the following analysis, we examine the impact of these school expansion policies on schooling levels within a

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8/ For a description of this reform, see Moock and Bellew (1988).

context of family resources and preferences for schooling. Since education choices reflect families' preferences for schooling and economic tradeoffs, the interplay of these influences add to our understanding of the effectiveness of policy reforms.

III. Framework, Data, and Variables

In this section, we discuss a framework for analyzing the determinants of school enrollment and completion levels by reviewing research pertinent to our study, and drawing specific hypotheses from models of schooling choice. We then present the empirical model and relationships to be estimated, and briefly discuss the sample drawn for this analysis from the Peru Living Standards Survey (PLSS).

The Schooling Decision

Three classes of research literature are relevant to our study. One is the literature on returns to education or why people invest in schooling; another is the literature that deals with who makes the schooling decision(s); and the third pertains to the process of education itself. Each of these literatures is vast and rich. We do not attempt to review them exhaustively, but to provide a brief summary of their principal hypotheses and findings.

Returns to education models. There are two competing hypotheses in the economic literature about returns to education. The human capital model asserts that the principal benefit from education is that it raises a person's productivity, whether in the workplace or at home, at work or at play. In the workplace, this increase in productivity translates into higher earnings (Becker, 1964; Mincer, 1974, among others); at home, it means more efficient home production, such as child care (Gronau, 1977). Also related to this model are the hypotheses that more highly educated people learn (that is,

produce even greater human capital) more effectively (Ben-Porath, 1967), or are better able to deal with problems or "disequilibria" in their lives (Schultz, 1975). In the alternative screening or signalling model, which emphasizes the benefits of education in the workplace, more education means higher earnings because it serves as a signal to employers (or clients) about desirable attributes of a prospective employee (or agent). Both models propose that a person will invest in education up to that level at which the marginal returns to that investment equals the marginal benefits from it.

These theories imply that the decision to begin or continue schooling is a function of returns, on the one hand, and of costs, on the other. Returns are usually measured as expected earnings in the labor market corresponding to given levels of education. Costs, which include both direct outlays and indirect (time) costs, are often measured by availability of, or distance to, school.

The presence of primary and junior high schools in the community has been found to increase enrollment and years of completed schooling in Brazil (Birdsall, 1985), Indonesia (Chernichovsky and Meesook, 1985), and Nepal (Moock and Leslie, 1986). Distance to a primary school was found to be negatively associated with enrollment and schooling attainment in Egypt (Cochrane et al., 1985), the Philippines (King and Lillard, 1983), Nepal (Shrestha et al., 1983), and in Thailand (Cochrane and Jamison, 1983). Similar effects have been found for secondary schools in Malaysia and the Philippines (King and Lillard, 1987). The few studies that have estimated the effect of the opportunity cost of schooling on enrollment or attainment in

developing countries have found a negative effect (e.g., Rosenzweig and Evenson, 1977).

Genetically determined ability also affects learning and educational attainment, and thus income; but, due to limited data on cognitive ability, the effect of this factor on income has been neglected in most determinants of schooling and rate of return studies. Griliches and Mason (1972), in a study for the U. S., estimated that failure to control for the effect of ability overstates the estimated rate of return to education by between 7 and 15 percent. In a study for Tanzania and Kenya, Boissiere, et al. (1985) found that, when controlling for ability, the rate of return was lowered by about 60 percent.

Decision-making models. Before the child quantity-quality models (Becker and Lewis, 1973; De Tray, 1974; Becker and Tomes, 1976) became popular in economics, most empirical applications of the human capital model implicitly treated education as a choice made primarily by the student. Given that those studies dealt mainly with variation in enrollment at secondary or post-secondary levels, that assumption may be reasonable. However, modeling schooling choice as part of a household decision is more appealing and more accurate because the emphasis on the family or the household, rather than the individual, as the decision-making unit, captures the close economic ties between the individual and the family. Moreover, enrollment in primary school, which is not universal in many developing countries despite compulsory attendance laws, is most certainly a decision made by parents or elders.

Recognizing that children are the "poor man's capital", some studies have modeled the schooling decision jointly with child labor supply.

The household choice model of schooling investments implies that family background is an important determinant of enrollment and attainment not only because it may reflect the student's schooling preferences and income, but also because it measures the support for education that the student is likely to receive at home. Studies of parental influences on education have found strong positive effects.

School inputs. From the third type of literature we learn about how school inputs affect student achievement in developing countries (Fuller, 1985; Heyneman and Loxley, 1983). Most reviews conclude that, controlling for family background, school characteristics have significant effects on achievement. For example, Heyneman and Loxley (1983) found that four family background variables (mother's and father's education, father's occupation, and books in the home) explained an average of 18 percent of the variance in student achievement in a study of 9 developing countries, compared to 24 percent explained by school characteristics. Although research in this area has shifted recently to exploring other questions such as the relative effects on achievement of alternative inputs, material versus nonmaterial inputs, or administrative and teaching quality (Lockheed and Komenan, 1987), sufficient data to support studies of this genre are harder to come by. As a result, little of this research has been undertaken in developing countries. Moreover, measures of student achievement, such as test scores, are often unavailable; and when available, they are often difficult to interpret.

Empirical Model

The literature discussed above implies that any schooling decision would be influenced by a host of factors, ranging from the person's learning ability, to wages in the labor market, to school availability and school inputs. Without data on cognitive ability or on aggregate wages for types of labor or school availability at the time of schooling, which is sometimes decades ago, we can only specify a partial model of educational attainment. Given these constraints, we estimate the following relationship:

$$E = \alpha'X + \epsilon_1 \qquad (1)$$

where E is the number of years of schooling at the time of the survey [9]; X is a vector of explanatory variables; and, ϵ_1 is a random disturbance term. We estimate this relationship separately for males and females to allow the α coefficients to vary between sexes. The specific measures for these sets of factors are discussed later in section V.

Equation (1) is estimated using the full sample, that is, all individuals who attended school as well as those who never attended. For the former group, we are able to estimate a second schooling attainment regression in order to examine the effects of school characteristics. Data on school

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[9] Number of years of schooling does not include the number of grades repeated. A student who completed five years of schooling but repeated one grade would have spent six years in school. For this person, the dependent variable E would equal 5, not 6.

characteristics are available only for this group. However, this second regression is likely to yield biased coefficients because the sample would be drawn on the basis of a dimension of schooling choice, that of enrollment. The statistical problem is not one of truncation or censoring bias since the value of the dependent variable (number of years of schooling) is known. Rather, it is a special missing data problem where the occurrence of the missing data is not random but corresponds to zero values of the dependent variable. Usual missing data remedies do not suffice to correct for this problem. We opt for a method similar to Heckman's (1979) two-step sample selection bias correction. We define a variable that captures the probability of being in the sample. The variable is obtained from the first step of the procedure which estimates the following relationship underlying the probability S of ever having attended school:

$$S^* = \phi'W + \mu \qquad (2)$$

and $S = 1$ if $S^* > 0$

$S = 0$ otherwise,

where W is a vector of variables that explain school entry[10/] and μ is a random error term. From probit estimates, we compute λ which is the ratio of the ordinate of the standard normal distribution to the cumulative normal.

We then estimate the following regression:

10/ The variables entered to explain school entry are the same as those of vector X in equation (1).

$$E = \alpha'X + \beta'Z + \delta\lambda + \epsilon_2 \qquad (3)$$

where Z pertains to characteristics of the primary school attended. By including λ in equation (3), we estimate the coefficients of primary school characteristics on educational attainment given that the error term is associated with the probability of having attended school. Our results indicate that estimating the effects of the included factors on years of schooling based only on the sample of adults who have ever attended school does yield biased estimates. The coefficients of λ in both the male and female regressions are significantly different from zero, and the estimated coefficients of a few included variables are significantly different in the specifications with and without λ[11/].

Variables

The explanatory variables in equations (1) and (3) include birth cohort, parental background, and community and school characteristics. Below

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11/ The coefficients of λ presented in Tables 4-5 and in Appendix Tables B.6-B.7 are statistically significant and negative in sign. The negative sign indicates a negative covariance between the error terms in equations (2) and (3). Due to data limitations, we do not have variables besides the school characteristics to identify the choices of entry to school and years of schooling. We compared the estimates from the specifications with and without λ to examine the selection bias. The coefficients of two family background variables were significantly different when comparing the two sets of specifications, namely, "mother has no job" in the regression for males, and "lived in a city at age 13" in the regressions for males and females. Their coefficient estimates are much larger in the specification without λ, implying that their impact on years of schooling comes primarily from their effect on entry to school. Without λ, the coefficients of the school variables are also numerically larger, though not significantly so.

we define these variables and discuss their expected relationship to years of schooling.

Birth Cohort. Birth cohort reflects changes in aggregate conditions prevailing during different time periods. They serve as a crude measure of shifts in the labor market, changes in the economy, or reforms in education that have affected school availability. We do not have direct measures for these factors. Because the effect of these events are confounded in the estimates of α, the results are illustrative and meaningful only if they are linked to historical events such as those discussed in Section II for Peru. To better capture the cohort effect, we defined birth cohort variables as splines with each segment corresponding to a five-year period (except for the earliest and most recent periods), namely, 1925-39, 1940-44, 1945-49, 1950-54, 1955-59, 1960-66.[12/]

Parental Background. Parents' characteristics in the equations include years of schooling completed by the mother and father, and their occupations. Parents' education is intended to capture several factors--taste for schooling which may have been passed on to their children, ability to supervise children's education, and income which determines ability to pay for education. Although these are different factors, their effects are all predicted to be positive and thus difficult to disentangle. No better measures for each effect were available. Parents' income is not included in the

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12/ Those born in 1925-39 were grouped together because (1) there were fewer observations for the oldest cohorts, and (2) the unavailability of data prior to 1950 makes it impossible to link the educational experiences of this group to historical events.

analysis because it is unavailable for respondents who were not living with their parents during the survey. Moreover, current measures of parents' incomes are not likely to reflect true cross-sectional differences at the time of schooling. In the absence of direct income measures, we use parents' occupations as proxy, albeit crude, measures of income. The occupational categories used are broad, but reflect occupations parents had most of their lifetime.

The variables for mothers' and fathers' occupations are binary variables, representing the following types of occupation: (1) "white-collar," which includes professional, clerical, service, and sales occupations; (2) "blue-collar," which pertains to production and transportation occupations; (3) "agricultural", which we choose to be our reference category in the regressions; and, (4) "no job".[13/]

Dummy variables indicating whether the child lived with the mother and/or father at age 10 are also entered in the regressions. They indicate whether either or both parents were present to supervise the schooling of the child, and, perhaps more importantly, capture the effect of family stability on a child's education. If the child did not reside with the parents, we do not know the reason for the separation nor do we know if the separation was permanent or temporary. In any case, we expect a stable family environment and parental supervision to have positive effects on school attainment.

13/ A fifth category is "missing occupation data." Since there are so few fathers who do not work, categories (4) and (5) have been collapsed into category (5) for them.

Community Characteristics. Community characteristics at the time of schooling are meant to capture the effect of differences in communities' levels of economic development, public services, and school availability. The level of community economic development determines opportunities for work in the local labor market and, thus, returns to schooling in the area. The level of public expenditures in the area contributes to its economic health and the availability of transportation, schools, and other facilities. For our sample, we do not have measures of public community characteristics at the time of schooling. In their absence, we use two city-noncity dummy variables that take on a value of 1 if the individual lived in a city at age 8 and 13, i.e., ages corresponding to the official ages of entry into the primary and secondary levels.[14/] The premise for this is that city dwellers generally have greater access to public facilities, such as schools, and more active labor markets than do rural residents. To the extent that the availability of schools influences an individual's choice of residence, these variables may be endogenous. However, this is less likely to be the case for 8- and 13-year olds than for older youths.

School Characteristics. The primary school characteristics we use in equation (3) refer to the school the respondents attended, not to the primary school that is generally available to the community. Thus, it can be argued that the values of these variables are themselves a result of family decision-making which would bias the coefficients. To the extent that only

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14/ These variables were constructed from migration data and there is some error in their measurement. For those individuals who migrated more than twice during their school-age years (about 5 percent of the sample), we are unable to identify residence. These individuals were assigned the location to which they had first migrated.

one primary school is available in some communities, we need not worry about this statistical problem.

The variables entered in the regressions include the availability of reading and/or math books, the availability of furniture in the school, and the number of teachers and number of grades offered in the school. We expect these four variables to have positive effects on schooling attainment. The availability of textbooks and school furniture are measures of school quality. Past studies, as reviewed by Fuller (1985), have found that availability of instructional materials, particularly those relating to reading and writing, have a positive impact on school achievement, especially in rural schools. By improving school achievement, these material inputs are also likely to have a positive impact on attainment levels. The number of teachers and grades offered in the school are crude measures of school size and supply. Given the number of grades offered, the number of teachers is an indicator of both the number of school places and of school quality. However, without information on class size, we cannot draw any conclusions about quality from this variable. The number of grades offered roughly measures supply. A grade-four student who wants to continue on to grade 5 cannot do so if the available and affordable primary school does not offer grade 5.

Lastly, some schools in Peru offer free food to students. Such schools generally serve poorer areas where children are likely to complete fewer years of schooling. We expect these food programs to raise completed schooling levels in those areas served. To explore the effect of this school

feature, a dummy variable indicating if there was a food program in the primary school attended is also included in the regressions.

IV. Data Description and Sample Profiles

Sample Distribution by Gender, Cohort, and Residence.[15]

The sample for the analysis consists of 5,644 females and 5,241 males aged 20-59 drawn from the Peruvian Living Standards Survey (PLSS). The PLSS was fielded from June 1985 through July 1986 by Peru's Instituto Nacional de Estadistica (INE). The survey questionnaire was developed by the World Bank in collaboration with INE and the Central Bank of Peru. For details about the PLSS sample and survey design, see Grootaert and Arriagada (1986). A sample of adults was chosen to allow us to observe completed schooling levels. Yet, since 23% of those aged 20-24 were still enrolled in school when the data were collected, we do not fully capture the final education levels of more highly educated persons.

A breakdown of the sample by current place of residence and by birth year is displayed in Table 1. The individuals in the sample are, on average, nearly equally distributed across Lima, other urban and rural areas, with a slightly larger proportion residing in rural areas. The spatial distribution of the sample differs, however, by cohort. Over 40 percent of the oldest cohorts live in rural areas, compared to about one-third of the youngest cohorts.

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[15] We do not estimate the models separately by current place of residence, i.e. Lima, other urban, and rural areas, because current place of residence could differ from place of residence at the time of schooling due to migration. Rather, place of residence is included as an explanatory variable in the regressions.

Table 1

Sample Distribution By Gender, Cohort, and Region

Females								
Birth year		1925-39	1940-44	1945-49	1950-54	1955-59	1960-66	All
All regions	Number	1,306	619	715	808	907	1,289	5,644
	Row %	23.1	11.0	12.7	4.3	16.1	22.8	100
Lima	Number	343	193	205	252	316	431	1,740
	Row %	19.7	11.1	11.8	4.5	18.2	24.8	100
	Column %	26.3	31.2	28.7	1.2	34.8	33.4	30.8
Other Urban	Number	380	150	221	246	293	406	1,696
	Row %	22.4	8.8	13.0	4.5	17.3	23.9	100
	Column %	29.1	24.2	30.9	0.4	32.3	31.5	30.0
Rural	Number	583	276	289	310	298	452	2,208
	Row %	26.4	12.5	13.1	4.0	13.5	20.5	100
	Column %	44.6	44.6	40.4	8.4	32.9	35.1	39.1

Males								
Birth year		1925-39	1940-44	1945-49	1950-54	1955-59	1960-66	All
All regions	Number	1,265	582	654	712	812	1,216	5,241
	Row %	24.1	11.1	12.5	13.6	15.5	23.2	100
Lima	Number	323	165	180	241	286	405	1,600
	Row %	20.2	10.3	11.3	15.1	17.9	25.3	100
	Column %	25.5	28.4	27.5	33.8	35.2	33.3	30.5
Other urban	Number	359	147	188	219	253	392	1,558
	Row %	23.0	9.4	12.1	14.1	16.2	25.2	100
	Column %	28.4	25.3	28.7	30.8	31.2	32.2	29.7
Rural	Number	583	270	286	252	273	419	2,083
	Row %	28.0	13.0	13.7	12.1	13.1	20.1	100
	Column %	46.1	46.4	43.7	35.4	33.6	34.5	39.7

Educational Profiles by Gender and Residence

Table 2 presents the educational profiles of the sample by gender and type of residence. There are clearly large differences in levels of educational attainment between males and females, and between those residing in Lima, other urban and rural areas. Females, on average, have completed only 5.5 years of schooling compared to 7 years for males. While only 8 percent of the males never attended school, 25 percent of the females never enrolled; and, only 28 and 12 percent of the females had some secondary and higher education, respectively, compared to 35 and 18 percent of the males. These results are very similar to the 1981 census results (Appendix Table A.1). In comparison to the census data, average years of schooling for males and females have risen slightly since 1981; a smaller proportion report primary schooling as their terminal level since a slightly larger proportion have continued on to higher education.

Table 2

Educational Attainment of Males and Females, Residents in Lima, Other Urban, and Rural Areas

Educational attainment	Females	Males	Lima	Other Urban	Rural
Average years of schooling (standard deviation)	5.5 (4.6)	7.1 (4.4)	8.8 (3.9)	7.5 (4.3)	3.2 (3.5)
Highest level of schooling attended (percent of sample)					
Never attended	24.3	7.7	3.2	7.3	33.2
Primary	35.9	39.4	24.0	34.9	50.2
Secondary	28.2	35.3	48.9	37.4	13.8
Post-secondary	11.7	17.7	23.9	20.4	2.9

The largest differences in educational attainment are observed between rural and urban areas. Males and females residing in Lima have the highest levels of education (about 9 years). In contrast, those living in rural areas have completed, on average, only 3 years of schooling. Moreover, 33 percent of all rural adults have never been to school; and only 14 and 3 percent have continued on to secondary and higher education, respectively, compared to 49 and 24 percent of adults in Lima. The relatively high proportion of Lima residents with some secondary and post-secondary education reflects both the greater availability of such schools in Lima as well as the movement of individuals to Lima in search of more advanced education or better employment opportunities.

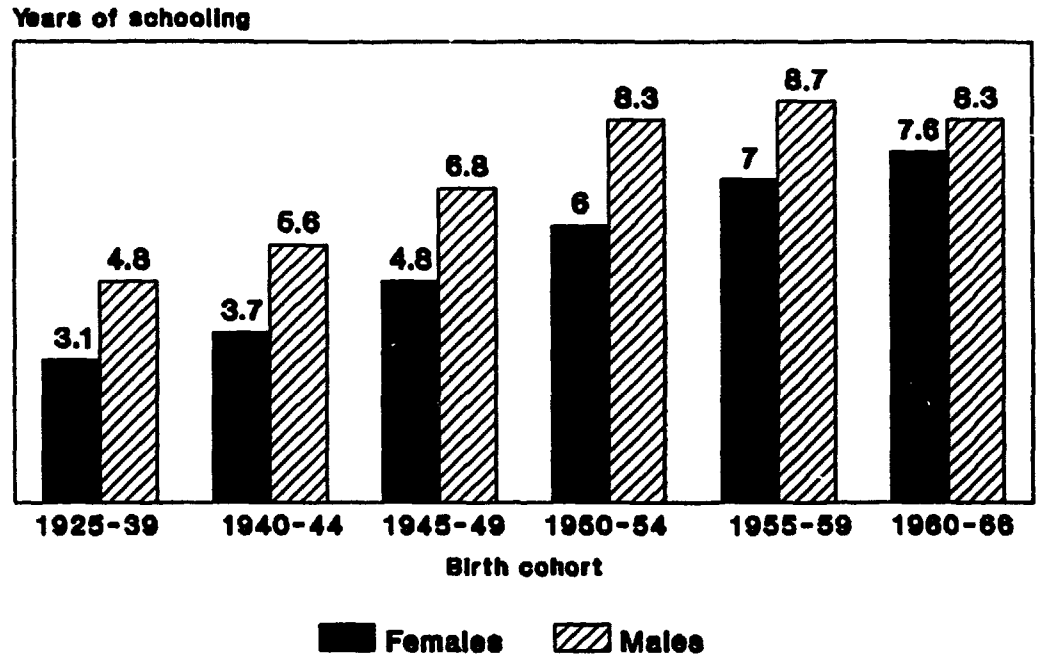
Changes in Educational Attainment Over Time

Figure 4 sketches birth cohort differences in the number of years of schooling completed by males and females. The patterns observed for the PLSS sample are comparable to the time trends described in Section II. Mean years of schooling of males and females have increased steadily over time. Females born in 1945-59 show the largest percentage increase in years of schooling completed relative to the cohorts that preceded them. As a result of rapidly rising female schooling levels, the gender gap in schooling has narrowed.

Trends for males follow a slightly different pattern than those for females. Males increased their years of schooling earlier; but, their gains tapered off with the cohort born in 1955-59. Of the youngest group, however,

23 percent are still in school, the majority in post-secondary institutions. The same is true of females.

Figure 4
Average Years of Education for Males and Females by Birth Cohort



This rising trend in the educational attainment reflects an increasing propensity both to enroll in school and to continue on to secondary and higher education. As shown in Table 3, the proportion of females who never attended school has fallen dramatically from over 40 percent in the two oldest cohorts to only 8 percent in the youngest cohort. For males, the proportion never enrolled in school fell from 15 percent of the oldest to 3 percent of the youngest cohort. The proportion of adults with some secondary schooling has increased more than threefold. The effect of the expansion of educational opportunities during the late 50s and throughout the 60s is

particularly evident for individuals born between 1945 and 1959, i.e., those who would have been of secondary school age at that time. Similarly, females born between 1950 and 1954 and who would have been of tertiary school age during the 60s also show a significant increase in post-secondary schooling.

Table 3

Highest Level of Education Attended
By Birth Cohort and Sex
(percent of sample)

Birth cohort	1925-39	1940-44	1945-49	1950-54	1955-59	1960-66
Females						
Never attended	43.0	36.5	28.1	19.7	12.6	8.3
Primary	40.7	42.5	39.6	37.1	32.2	27.6
Secondary	12.5	15.0	22.7	28.0	38.3	46.5
Post-secondary	3.8	6.0	9.7	15.2	16.9	17.6
Males						
Never attended	15.2	10.8	8.5	3.9	2.6	3.3
Primary	57.9	53.8	42.7	34.1	25.2	24.0
Secondary	18.5	19.9	32.4	36.4	45.1	54.6
Post-secondary	8.4	15.5	16.4	25.6	27.1	18.1

V. Results

The estimates of equations (1) and (3) described in section III are presented and discussed below. There are two main sets of results: one pertains to all birth cohorts combined, the other to each of the six cohorts. We first discuss the all-cohorts results. The parameter estimates for males and females are presented in Tables 4 and 5, respectively.

Full Sample Regressions

Family background. The full sample estimates in Tables 4 and 5 show that the education levels of both parents have strong, positive, and statistically significant effects on their children's schooling levels. However, there are differences in the estimates between males and females. First, the elasticity at the mean with respect to father's education (0.19) is double that of mother's education (0.09) in the equation for males, whereas the elasticities are about equal (0.19 and 0.21, respectively) in the equation for females.[16/] These differential effects of father's and mother's education

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16/ The elasticity at the mean of an explanatory variable is calculated as the coefficient estimate multiplied by the ratio of the mean of that variable to the mean schooling level in the sample. The elasticity indicates the percentage increase (or decrease) in schooling attainment that would be obtained as a result of a one percent change in the value of the explanatory variable. For example, an elasticity of .19 means that a 100 percent increase in the value of the explanatory variable will induce a 19 percent increase in the number of years of schooling completed.

for sons and daughters are statistically significant.[17] Second, a mother's level of education has twice as strong an effect on daughters' educational attainment as it does on sons' schooling levels. These results suggest a preference on the part of fathers to send their sons rather than their daughters to school, but mothers partly counterbalance this preference.

Family stability and parental supervision captured by the variables "living with mother (father) at age 10" have a positive, though small, impact on schooling.[18] Similar to the patterns observed for parents' education, the father's presence has double the effect of the mother's presence on the educational attainment of sons while both parents have nearly equivalent effects for daughters. Residing with one's father increases educational attainment by 0.4 year for sons and daughters.[19] Living with one's mother at age 10 raises it by ..2 year for sons and 0.5 year for daughters.

Finally, the coefficients on parents' occupations show two noteworthy results. (a) Children of parents holding white-collar jobs tend to have more years of schooling than do farmers' children--0.6 year more for sons

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[17] T-tests were conducted to determine if the estimated coefficients on father's and mother's education were significantly different from each other in the equations for men and for women. The resulting t-statistic for men indicates that mother's education has a significantly lower impact than father's education on sons' levels of schooling. For women, the t-value showed that mother's education has a significantly greater impact than father's education on daughters' schooling levels.

[18] About 10 percent of the males and females in the sample were not residing with their mothers at that age; 20 percent were not living with their fathers.

[19] We also checked if the impact of parents' schooling depends on co-residence with one's parents, but obtained small and insignificant coefficients.

and 1.1 year more for daughters if the mother has a white-collar job, and 1.1 and 1.4 year more for sons and daughters, respectively, if the father is a white-collar worker. (b) Children of mothers who do not work tend to have more years of schooling (0.6 years more for both sons and daughters) than do children of mothers in farm-related occupations. Finding (a) reflects relatively greater perceived benefits from education by parents with white-collar jobs, and also reflects an income effect. Finding (b) suggests that mothers who are not employed outside the home can spend more time supervising their children's education. Moreover, relative to farmers, these mothers are more likely to belong to better-off families--an income effect.

Community characteristics. As mentioned earlier, due to lack of data on specific community characteristics at the time of schooling, we included variables that indicate type of residence at age 8 and 13. The results show that residing in a city at age 8 did not significantly affect the education attainment of males but exerted a positive and significant impact on the final schooling levels of females. Since primary schools had become more available in rural areas, place of residence at age 8 did not affect male schooling attainment. However, this improvement in school supply in rural areas was not sufficient to erode the advantage of urban females. For females, having lived in a city at age 8 meant 0.6 year more schooling.

Although the number of secondary schools increased even in rural areas, residing in a city at age 13, the age at which one is likely to enter high school, remained an important factor in determining male and female schooling levels, adding 1.5 years to male levels, and about 1 year to female

levels. These estimates capture two effects, namely, the greater availability of secondary schools in urban areas which lowers the cost of attending these schools for city dwellers, and also the lower demand for secondary education in rural areas. The two city-noncity variables together indicate that, ceteris paribus, living in a city during the early school ages meant a higher attainment level of about one and one-half years for males and females alike.

Primary school characteristics. As described in Section III, the effects of school inputs were estimated only for the subsample of individuals who had ever attended school. For the results, turn to the selected sample regressions in Table 4 and 5. We find statistically significant, positive coefficients for the books and the school size variables. Noting that the coefficient estimates for the birth cohorts are lower when these variables are added to the model, we conclude that period changes in the school system, reflected in the birth cohort results, worked through policy reforms aimed at improving school inputs and expanding the number of schools. These efforts increased access to education and raised the probability of continuing on in school.

Having reading and/or math books in school for each pupil raises schooling levels by about one-half year for both males and females. Providing a desk and chair for each pupil also has a positive effect on attainment, about 0.4 year for males and 0.2 year for females (but the latter is not statistically significant). Considering the low unit cost of these material inputs, the results indicate a very high pay-off. Due to lack of more data on the educational process, we cannot trace the mechanism through which textbook

availability and school furniture affect schooling. Past studies have shown that the availability of textbooks, reading materials, and school furniture raise the quality of the learning process for students, thus raising school achievement.

The coefficients on the "grades" variable indicate that having a more complete primary school increased schooling attainment by about 0.8 year for males and 0.5 year for females for each additional grade offered. The greater response of males indicates that supply constraints at the primary level were more critical for raising male than female schooling. Conversely, this suggests a relatively weaker demand for female education. Controlling for the number of grades offered, having more teachers per school increases years of schooling of students, with the marginal effects being similar for males and females. The results show that the largest effect is obtained when increasing the number of teachers per school from 1 to 3. Having 4 or more teachers per primary school still has a positive effect, but it is much smaller. Finally, free food offered in school has a very small and insignificant effect on years of schooling.

Table 4

Regression Results--Males: All Cohorts

Variable	Full Sample		Selected Sample	
	Estimated coefficient	t value	Estimated coefficient	t value
INTERCEPT	1.698	7.70	-0.540	-1.17
BIRTH YEAR SPLINES:				
1960-1966	-0.035	-1.06	-0.035	-1.05
1955-1959	-0.124	-2.71	-0.132	-2.91
1950-1954	0.187	3.88	0.094	1.96
1945-1949	0.139	2.79	0.069	1.42
1940-1944	0.150	2.97	0.095	1.91
1925-1940	0.027	1.42	0.020	1.11
MOTHER'S YEARS OF SCHOOLING 1/	0.251	12.35	0.236	11.67
FATHER'S YEARS OF SCHOOLING 1/	0.339	18.98	0.194	9.51
LIVED WITH MOTHER AT AGE 10	0.253	1.69	0.053	0.36
LIVED WITH FATHER AT AGE 10	0.438	3.73	0.298	2.59
OCCUPATIONS: 2/				
MOTHER IS A WHITE-COLLAR WORKER	0.626	3.75	0.306	1.84
MOTHER IS A BLUE-COLLAR WORKER	-0.114	-0.68	0.003	0.02
MOTHER HAS NO JOB	0.551	4.94	0.056	0.49
FATHER IS A WHITE-COLLAR WORKER	1.144	7.40	0.782	5.02
FATHER IS A BLUE-COLLAR WORKER	1.044	8.38	0.453	3.57
LIVED IN A CITY AT AGE 8	-0.038	-0.21	-0.091	-0.49
LIVED IN A CITY AT AGE 13	1.450	8.21	0.629	3.45
HAD READING AND/OR MATH BOOK(S)			0.547	5.33
NUMBER OF GRADES IN SCHOOL			0.792	12.16
SCHOOL HAD FURNITURE			0.353	2.60
SCHOOL SERVED FREE FOOD			0.028	0.29
NUMBER OF TEACHERS IN SCHOOL:				
1 - 3 TEACHERS			0.278	4.20
4 - 6			0.039	2.47
6 +			0.047	3.30
LAMBDA			-3.833	-7.02
ADJUSTED R^2	0.501		0.520	
F VALUE [DEGREES OF FREEDOM]	51.1 [21,5219]		181.9 [29,4811]	

1/ A dummy variable taking on the value of 1 if years of schooling was missing was also included. The coefficient estimates are not reported here.

2/ Omitted category is mother or father is an agricultural worker. Also included in the regressions is a missing data category. The results are not shown.

Table 5
Regression Results--Females: All Cohorts

VARIABLE	Full Sample		Selected Sample	
	Estimated coefficient	t value	Estimated coefficient	t value
INTERCEPT	-0.307	-1.51	-0.262	-0.51
BIRTH YEAR SPLINES:				
1960-1966	0.049	1.61	0.053	1.72
1955-1959	0.094	2.33	-0.0^6	-0.14
1950-1954	0.098	2.33	0.014	0.32
1945-1949	0.121	2.68	0.047	0.94
1940-1944	0.125	2.69	0.168	3.18
1925-1939	0.003	0.19	-0.015	-0.77
MOTHER'S YEARS OF SCHOOLING 1/	0.390	21.16	0.259	13.61
FATHER'S YEARS OF SCHOOLING 1/	0.279	17.42	0.118	6.66
LIVED WITH MOTHER AT AGE 10	0.490	3.65	0.354	2.41
LIVED WITH FATHER AT AGE 10	0.450	4.30	0.538	4.76
OCCUPATIONS: 2/				
MOTHER IS A WHITE-COLLAR WORKER	1.092	7.09	0.722	4.54
MOTHER IS A BLUE-COLLAR WORKER	0.135	0.93	0.075	0.48
MOTHER HAS NO JOB	0.652	6.57	0.229	2.03
FATHER IS A WHITE-COLLAR WORKER	1.359	9.64	1.031	7.28
FATHER IS A BLUE-COLLAR WORKER	1.262	11.00	0.327	2.67
LIVED IN A CITY AT AGE 8	0.611	3.38	0.578	3.21
LIVED IN A CITY AT AGE 13	1.048	6.09	0.015	0.09
HAD READING AND/OR MATH BOOK(S)			0.687	6.51
NUMBER OF GRADES IN SCHOOL			0.501	6.34
SCHOOL HAD FURNITURE			0.165	1.05
SCHOOL SERVED FREE FOOD			0.032	0.35
NUMBER OF TEACHERS IN SCHOOL:				
1 - 3 TEACHERS			0.282	3.99
4 - 6			0.099	1.86
6 +			0.066	2.92
LAMBDA			-2.097	-8.92
ADJUSTED R^2	0.609		0.540	
F VALUE [DEGREES OF FREEDOM]	418.8 [21,5622]		174.2 [29,4249]	

1/ A dummy variable taking on the value of 1 if years of schooling was missing was also included. The estimated coefficients are not reported here.

2/ Omitted category is mother or father is an agricultural worker. Also included in the regressions is a missing data category; results not shown.

Regressions by Cohort

The strong time trend resulting from policy reforms argues for estimating the schooling function separately for each five-year birth cohort. Moreover, testing the homogeneity of results across birth cohorts showed that the cohort effects were not limited to shifts in the intercept but also influenced the effects of other variables. To simplify the presentation of results for two sets of regressions models estimated for each birth cohort, in this section we focus on a few variables that show interesting cohort patterns. Appendix Tables B.4 - B.7 contain the full results. The means of all variables by cohort are presented in Appendix Tables B.2 and B.3 for males and females, respectively.

Parental influences on education. As in the all-cohorts regressions, the effect of parents' education on years of schooling completed is positive and statistically significant in each cohort regression; however, the effect diminishes over time. For both males and females, the effect of parents' education is smaller for the younger cohorts than it is for the older ones. The decline occurs after the 1950-54 and 1955-59 cohorts for females and males, respectively. Recall that the expansionist education policies of the government began in the mid-50s and 60s, and could have affected youths at the early years of schooling. Hence, one interpretation of this result is that past school reforms in Peru have been successful in improving access to education among broad sectors of the population, thereby weakening the linkage between socioeconomic status and education. Another explanation is that taste for education, influenced perhaps by higher returns to education in the labor

market, has increased across generations. This happened over a period when parents' own educational attainment had also risen. A third interpretation is that as education becomes more nearly universal and compulsory, it matters less what the parents' own attitudes towards schooling may be.

Table 6

Effect of Parents' Education by Cohort: Elasticities at Means

	1925-39	1940-44	1945-49	1950-54	1955-59	1960-66
Males						
Mother's education	.11	.11	.08	.07	.09	.06
Father's education	.20	.22	.24	.22	.10	.13
Females						
Mother's education	.24	.21	.19	.19	.13	.11
Father's education	.22	.24	.24	.22	.20	.13

Note: All these estimates are statistically significant at 1 percent in a two-tailed test. Elasticities were computed from results in Appendix Tables B.4 and B.5.

Turn now to the effects of other parental characteristics on schooling, focusing on females. In Table 7 we present the coefficient estimates for females; the estimates for males are contained in Appendix Tables B.4 and B.6. There are no clear patterns in the results pertaining to residence with parents at age 10, except for females who lived with their mothers at that age. The estimates displayed in Table 7 indicate that living with one's mother at age 10 had a large positive effect on schooling for the older cohorts, but not for the younger ones. These results may stem from the fact that a larger proportion of the younger females in the sample lived with

their mothers at age ten[20/], so there is much less variance in the younger cohorts. Another possible explanation is that, in the younger cohorts, daughters who lived away from home were more likely to have done so for educational reasons. In the older cohorts, because there was less demand for female education, this was less likely to have been the case.

Table 7

Effect of Mothers' Presence and Job on Females' Education
(in years of schooling)

Variable	1925-39	1940-44	1945-49	1950-54	1955-59	1960-66
Lived with mother	.79**	.88**	.78**	.28	-.54	-.02
Lived with father	.20	.18	.41	.54*	1.40**	.20
Mother's occupation						
White-collar job	.85**	1.17**	.90*	.94**	1.18**	1.05**
Blue-collar job	.22	.46	-.05	.14	.16	.25
Has no job	.79**	.92**	.36	.83**	.21	.61**
Father's occupation						
White-collar job	1.08**	.92**	1.25**	1.96**	1.35**	1.39**
Blue-collar job	.90**	.17	.97**	1.61**	1.28**	1.60**

Note: ** (*) means statistical significance at 1 (5) percent level in a two-tailed test.

The conclusion of a weakening link between socioeconomic background and educational attainment comes into question when examining the effects of parents' occupations on female schooling levels. We turn first to the results in the cohort regressions pertaining to mother's occupation. First, ceteris paribus, daughters of mothers with white-collar occupations have significantly

20/ In Appendix Table B.3 we see that 94 percent on women born in 1960-66 lived with their mother at age 10, whereas only 86 percent of women born in 1925-39 did.

higher levels of schooling than farmers' daughters. They had about one more year of schooling. The magnitude of this effect seems to have been relatively stable across cohorts. Second, daughters of mothers with no jobs have significantly more education than farmers' daughters. However, the point estimate for the youngest cohort suggests that this difference may have narrowed, supporting the view that access to education became more equitably distributed over time.

In contrast, the coefficient estimates for "father is a white-collar worker," which are higher, increased significantly from the oldest cohort up to cohort 1950-54, and declined thereafter. These indicate a widening of the schooling gap, up to cohort 1950-54, between females whose fathers were white-collar workers and those whose fathers were farmers. This gap is widest for the cohorts born in 1945-54 who were the first potential beneficiaries of the early expansionist programs for primary education. However, as attitudes towards the education of females changed in the rural areas, the gap narrowed among the younger cohorts. Our results for males also indicate that those whose fathers held white-collar or blue-collar jobs had an edge over farmers' sons. That edge increased first during the expansionist programs but it eroded earlier than it had for females as well.

In general, the results from the cohort regressions on the effects of parental background indicate that the education policies of the mid-50s and 60s had equalizing effects across broad segments of the population. However, the initial impact of relaxing the supply constraint through building more schools was to worsen inequality among different groups who had divergent

views on the benefits of education and therefore had different demands for it. Perhaps as a result of the persistent message about the importance of education in Peru's development and the government's support for it, demand appears to have risen among females and rural residents as well.

Effects of school inputs. The primary school inputs that show any discernible cohort trend in their effect on years of schooling are textbooks, teachers, and number of grades offered in school. Consider the statistically significant coefficient estimates for the textbook variable. We note the following. First, for both males and females, the estimates increased numerically in the younger cohorts (that is, up to cohort 1955-59). These suggest that, as primary schools became more available, the availability of textbooks exerted a greater impact on schooling attainment. Second, the cohort regressions show a larger effect on females than males of having a textbook. Perhaps because there was less of a push within the family to educate females, the quality of the learning process was more important in determining how many years of schooling females had.

The number of grades offered in the primary school has a large positive effect that increased across cohorts. For males born before 1940, adding one more grade to the number of grades offered in the primary school would have increased schooling levels by one-half year. For males born in the 60s, adding a grade would have raised attainment levels by 1.3 years. The increase in this effect is largest for the cohort born in the early to mid-40s; their schooling years coincided with the early period of school expansion. A similar pattern across birth cohorts emerges for females, but

the increase occurs at a later time, that is, in the cohorts born after the mid-50s. These results suggest that supply was indeed a principal constraint in the older cohorts. Improving the availability of school places succeeded in meeting some of the existing demand for education; in addition, it raised schooling levels by generating a higher demand in the younger cohorts.

Holding constant the number of grades offered in a primary school, more teachers per school tended to increase schooling attainment. Table 8 presents the estimated effects of increasing the number of teachers in the school to 3. The coefficients are considerably smaller when increasing the number of teachers beyond 3. The few statistically significant coefficients suggest that this factor may have been more important in the younger than older cohorts. Since the number of grades is being controlled for, the teacher variable provides a rough measure of quality in that increasing the number of teachers would have raised the likelihood that one teacher handled one class at a time. The cohort trend, though weak, suggests that school quality had become more important in explaining the variance in educational attainment.

Table 8

Effects of Selected School Inputs by Cohort (in years of schooling)

Variable	1925-39	1940-44	1945-49	1950-54	1955-59	1960-66
Books						
Males	.54**	.25	.31	.58**	.92**	.32
Females	.64**	.69**	.89**	-.06	1.14**	.72**
Number of grades						
Males	.56**	.85**	.96**	1.20**	1.21**	1.34**
Females	.47**	.28	.52**	.49**	.84**	1.14**
Teachers 1-3						
Males	.21	.04	.27	.17	.48**	.41**
Females	.29**	.06	.16	.51**	.22	-.04

Note: ** (*) means statistical significance at 5 (10) percent level in a two-tailed test.

VI. Summary and Conclusions

Education is widely recognized in the Third World as a critical resource in the development process. True to this, successive administrations of the Peruvian government since the mid-50s instituted education policies designed to raise the skill levels and make educational opportunities available to broader segments of the population. Those policies rested primarily on expanding the supply of schools. Our analysis showed that, when the cost of schooling declined as a result of the increased supply of schools, school enrollment rates and attainment levels rose. The magnitude of the response varied across the population, partly due to geographical (community) differences in the changes in school supply, but also partly due to the different tastes, attitudes and resources of families themselves. Thus, a preference by parents to educate sons more than daughters meant that the greater supply of schools affected male schooling levels more quickly than female schooling levels. For females and rural residents, relaxing supply constraints was not sufficient to bring schooling levels immediately on par with urban male levels. A change in attitudes and better economic opportunities for more educated females were important in strengthening the demand for education for these groups.

The empirical analysis of the determinants of schooling levels in Peru showed that individual, family, community and school factors together contributed to raising overall education levels. The following findings are noteworthy:

1. School expansion policies pursued by the government from the 50s through the 60s played an important role in raising education levels, and in narrowing the gap between rural and urban residents, and between males and females. The analysis by age cohort indicates that male and urban schooling levels improved earlier than female and rural levels.

2. Parents' years of schooling and their occupations were significant determinants of educational levels in Peru. However, the impact of these socioeconomic factors lessened over time as the supply of schools expanded throughout the country, and primary education became more widely available. By weakening the link between socioeconomic background and access to schools, the government's expansion policies improved opportunities for socioeconomic mobility for broad segments of the population.

3. The relative impact of parents' education differed for sons' and daughters' schooling. Father's education had twice as large an effect on sons' schooling as mother's education. However, for daughters, both parents' education had strong positive and equivalent effects. These differential effects of parents' education reflect a preference on the part of fathers to send their sons to school, while mothers partly counterbalanced this preference.

4. Because of the rapid expansion of primary schools even in rural areas, rural residence per se during the primary school ages did not deter the schooling of males in a significant way. However, urban or rural residence mattered greatly for females, suggesting that the expansion of schools in the rural areas was not sufficient to overcome the propensity of parents there to invest less in the schooling of their daughters.

5. Having lived in a city at age 13 meant one and one and one-half more years of schooling for males and females, respectively. Though the number of secondary schools also increased in the 60s and 70s in rural areas, urban residents continued to have greater access to secondary schools than rural residents. Partly due to this disparity between urban and rural areas in the availability of secondary schools and partly due to a lower demand for secondary education in rural areas, urban residence had a significantly positive effect on attainment.

6. Material school inputs such as books and desks at the primary level contributed to raising schooling levels. Our estimates indicate a high pay-off to these relatively inexpensive inputs. For example, students who had a textbook for their own use attained over one-half more year of schooling than students who did not. Also, we find some evidence suggesting that such school inputs were more important in determining how many years of schooling females had.

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[21/] Education data in the World Bank data bases are supplied by UNESCO.

Appendix A

APPENDIX A

Table A.1

Educational Attainment of Peruvians Aged 15 and Over, 1940-1981

	1940	1961	1972	1981
Literacy Rate	42	61	73	82
Males	55	74	83	90
Females	31	48	62	75
Urban	.	82	88	92
Rural	.	41	49	62
Mean Years of Schooling	1.9	3.1	4.4	6.0
Males	2.4	3.8	5.1	6.7
Females	1.4	2.4	3.6	5.4
Highest Level of Education Attended (percent)				
None	58	39	27	16
Males	45	26	16	9
Females	69	52	37	23
Primary	34	48	48	42
Males	47	58	54	44
Females	27	38	42	40
Secondary	1	2	5	10
Males	6	14	24	35
Females	3	9	17	28
Post-secondary	1	2	5	10
Males	2	3	6	12
Females	0.3	1	3	9

Sources: Literacy Rates: Instituto de Planification. Education: Censos Nacionales 1981; Fernandez, H. 1986.

Table A.2

Percent of Peruvians Aged 6-14 and 15-19 Enrolled In School, 1940-1981

	1940	1961	1972	1981
Ages 6-14				
Total	30	58	78	90
Males	34	62	82	91
Females	26	53	75	88
Urban	.	.	90	96
Rural	.	.	63	79
Ages 15-19				
Total	17	33	49	56
Males	23	41	57	61
Females	11	26	41	52
Urban	.	.	54	63
Rural	.	.	17	24

Source: Censos Nacionales, 1981; Fernandez, H., 1986.

Table A.3

Trends In Peruvian Education:
Selected Indicators, 1950-1980

	1950	1955	1960	1965	1970	1975	1980
Indicator in thousands							
Primary							
Schools	10.5	11.2	14.2	18.5	18.4	19.7	20.8
Teachers	23.2	28.2	38.5	53.1	66.0	72.6	84.4
Student enrolled	1,010	1,128	1,358	1,901	2,341	2,841	3,161
Percent female	40	41	44	45	46	47	48
Secondary							
Teachers	5.4	9.0	15.8	22.3	31.6	34.1	45.1
Students enrolled	72.5	112.2	174.8	324.5	546.2	813.5	1,152
Percent female	35	37	40	41	43	44	45
Post-Secondary							
Universities 1/	8	9	10	27	31	33	43
Faculty	2.5	2.5	3.1	.	11.7	13.2	18.3
Students enrolled	17.4	20.2	35.0	80.1	133.6	216.5	290.8
Percent female	23	17	29	34	34	32	35
Enrollment Ratios							
Primary enrollment as a percent of population aged 6-11							
Males	100	95	98	111	114	119	117
Females	69	65	77	93	99	108	111
Secondary enrollment as a percent of population aged 7-12							
Males	9	12	16	25	34	42	53
Females	5	7	11	18	27	35	46
Tertiary enrollment as a percent of population aged 18-22							
Males	4	4	6	10	14	20	22
Females	1	1	2	5	8	10	12

Sources: Ministerio de Planification; World Bank, 1988.

1/ Figure includes private and state universities only. Faculty and student totals include all post-secondary institutions.

Table A.4

Average Annual Enrollment Growth Rates

	1950-55	1955-60	1960-65	1965-70	1970-75	1975-80
Primary						
Males	2.1	2.6	6.6	3.9	3.6	1.7
Females	2.4	5.4	7.5	4.7	4.4	2.6
Secondary						
Males	8.5	8.1	12.9	10.3	7.5	7.2
Females	10.3	11.2	13.6	12.0	9.4	7.2
Post-secondary						
Males	4.6	8.0	16.3	10.8	10.9	5.1
Females	-3.0	24.8	21.8	10.8	8.7	8.1

Source: Appendix Table A.3.

Appendix B

APPENDIX B

Table B.1

Means and Standard Deviations of Regression Variables for All Birth Cohorts, For Males and Females

	Females		Males	
Variables	Mean	st.dev.	Mean	st.dev.
YEARS OF SCHOOLING	5.452	4.64	7.053	4.39
BIRTH YEAR SPLINES:				
1960-1966	0.993	2.01	1.004	2.01
1955-1959	1.619	2.20	1.628	2.21
1950-1954	2.376	2.38	2.337	2.38
1945-1949	3.042	2.33	2.988	2.35
1940-1944	3.623	2.14	3.578	2.16
1925-1940	13.130	3.91	13.033	3.99
MOTHER'S YEARS OF SCHOOLING	2.329	3.18	2.318	3.20
FATHER'S YEARS OF SCHOOLING	3.658	3.88	3.648	3.84
LIVED WITH MOTHER AT AGE 10	0.887	0.32	0.889	0.31
LIVED WITH FATHER AT AGE 10	0.786	0.41	0.795	0.40
MOTHER IS A WHITE COLLAR WORKER	0.105	0.31	0.109	0.31
MOTHER IS A BLUE COLLAR WORKER	0.105	0.31	0.094	0.29
MOTHER DOES NOT WORK	0.364	0.48	0.369	0.48
MOTHER'S OCCUPATION IS MISSING	0.095	0.29	0.094	0.29
FATHER IS A WHITE COLLAR WORKER	0.166	0.37	0.171	0.38
FATHER IS A BLUE COLLAR WORKER	0.230	0.42	0.249	0.43
FATHER'S OCCUPATION IS MISSING	0.037	0.19	0.035	0.18
LIVED IN A CITY AT AGE 8	0.367	0.48	0.366	0.48
LIVED IN A CITY AT AGE 13	0.400	0.49	0.408	0.49
HAD READING AND/OR MATH BOOK(S)	0.595	0.49	0.700	0.46
NUMBER OF GRADES IN SCHOOL	4.928	0.47	4.860	0.66
SCHOOL HAD FURNITURE	0.701	0.46	0.821	0.38
SCHOOL SERVED FREE FOOD	0.271	0.44	0.306	0.46
NUMBER OF TEACHERS IN SCHOOL	5.690	6.43	6.628	6.58

Table B.2

Means and Standard Deviations of Variables
in Males's Regressions, By Birth Cohort

Birth cohort:	1925-1939		1940-1944		1945-1949		1950-1954		1955-1959		1960-1966	
Variable	Mean	std	Mean	std	Mean	std	Mean	std	Mean	std	Mean	std
YEARS OF SCHOOLING	4.838	4.18	5.897	4.63	6.788	4.55	8.257	4.46	8.787	4.61	8.248	3.87
MOTHER'S YEARS OF SCHOOLING	1.558	2.75	1.735	2.72	1.959	3.02	2.617	3.42	2.835	3.44	3.059	3.39
FATHER'S YEARS OF SCHOOLING	2.515	3.44	2.898	3.44	3.194	3.49	4.058	4.08	4.348	3.94	4.731	4.02
LIVED WITH MOTHER AT AGE 16	0.843	0.36	0.835	0.37	0.858	0.35	0.914	0.28	0.925	0.26	0.948	0.24
LIVED WITH FATHER AT AGE 16	0.743	0.44	0.741	0.44	0.755	0.43	0.803	0.39	0.841	0.36	0.863	0.34
MOTHER IS A WHITE-COLLAR WORKER	0.053	0.22	0.077	0.27	0.098	0.29	0.121	0.32	0.128	0.33	0.171	0.38
MOTHER IS A BLUE-COLLAR WORKER	0.076	0.27	0.082	0.28	0.087	0.28	0.096	0.29	0.098	0.28	0.124	0.33
MOTHER HAS NO JOB	0.469	0.50	0.469	0.50	0.448	0.49	0.389	0.48	0.331	0.47	0.187	0.39
MOTHER'S OCCUPATION IS MISSING	0.031	0.17	0.043	0.20	0.052	0.22	0.105	0.30	0.145	0.35	0.168	0.37
FATHER IS A WHITE-COLLAR WORKER	0.128	0.33	0.155	0.36	0.149	0.36	0.192	0.39	0.192	0.39	0.209	0.41
FATHER IS A BLUE-COLLAR WORKER	0.169	0.38	0.201	0.40	0.215	0.41	0.278	0.44	0.302	0.45	0.325	0.47
FATHER'S OCCUPATION IS MISSING	0.022	0.15	0.038	0.19	0.024	0.16	0.043	0.20	0.045	0.20	0.048	0.20
LIVED IN A CITY AT AGE 8	0.289	0.44	0.285	0.45	0.325	0.47	0.396	0.48	0.431	0.49	0.465	0.50
LIVED IN A CITY AT AGE 13	0.309	0.46	0.339	0.47	0.383	0.49	0.445	0.49	0.474	0.50	0.493	0.50
HAD READING AND/OR MATH BOOK(S)	0.548	0.50	0.598	0.49	0.642	0.48	0.742	0.44	0.815	0.39	0.846	0.36
NUMBER OF GRADES IN SCHOOL	4.778	0.93	4.723	0.84	4.841	0.65	4.919	0.46	4.931	0.41	4.948	0.37
SCHOOL HAD FURNITURE	0.693	0.46	0.761	0.43	0.803	0.40	0.869	0.34	0.893	0.31	0.915	0.28
SCHOOL SERVED FREE FOOD	0.125	0.33	0.235	0.42	0.328	0.47	0.426	0.49	0.394	0.49	0.393	0.49
NUMBER OF TEACHERS IN SCHOOL	4.402	5.06	5.227	5.96	6.683	6.64	6.954	6.08	8.139	6.97	8.786	7.31

Table B.3

Means and Standard Deviations of Variables
For Females's Regressions, By Birth Cohort

Birth cohort:	1925-1939		1940-1944		1945-1949		1950-1954		1955-1959		1960-1966	
Variable	Mean	std	Mean	std	Mean	std	Mean	std	Mean	std	Mean	std
YEARS OF SCHOOLING	3.123	3.83	3.667	4.19	4.815	4.59	6.066	4.92	6.977	4.58	7.603	3.98
MOTHER'S YEARS OF SCHOOLING	1.532	2.65	1.693	2.85	2.006	2.95	2.593	3.28	2.839	3.39	3.100	3.43
FATHER'S YEARS OF SCHOOLING	2.560	3.62	2.767	3.44	3.249	3.69	3.926	3.83	4.342	3.78	4.777	4.11
LIVED WITH MOTHER AT AGE 16	0.859	0.35	0.868	0.34	0.853	0.35	0.879	0.33	0.902	0.30	0.936	0.24
LIVED WITH FATHER AT AGE 16	0.750	0.43	0.753	0.43	0.761	0.43	0.786	0.41	0.800	0.40	0.845	0.36
MOTHER IS A WHITE-COLLAR WORKER	0.047	0.21	0.069	0.25	0.071	0.26	0.115	0.32	0.139	0.35	0.168	0.37
MOTHER IS A BLUE-COLLAR WORKER	0.089	0.28	0.095	0.29	0.074	0.26	0.093	0.29	0.109	0.31	0.147	0.35
MOTHER HAS NO JOB	0.436	0.50	0.391	0.49	0.488	0.50	0.394	0.49	0.356	0.48	0.199	0.40
MOTHER'S OCCUPATION IS MISSING	0.054	0.23	0.060	0.24	0.073	0.26	0.069	0.29	0.100	0.31	0.166	0.37
FATHER IS A WHITE-COLLAR WORKER	0.137	0.34	0.129	0.34	0.147	0.35	0.167	0.37	0.191	0.39	0.206	0.40
FATHER IS A BLUE-COLLAR WORKER	0.149	0.36	0.183	0.39	0.213	0.41	0.224	0.42	0.288	0.45	0.316	0.46
FATHER'S OCCUPATION IS MISSING	0.030	0.17	0.026	0.16	0.039	0.19	0.043	0.20	0.039	0.19	0.043	0.20
LIVED IN A CITY AT AGE 8	0.265	0.44	0.281	0.45	0.322	0.47	0.382	0.49	0.437	0.50	0.479	0.50
LIVED IN A CITY AT AGE 13	0.281	0.45	0.315	0.46	0.362	0.48	0.436	0.50	0.477	0.50	0.504	0.50
HAD READING AND/OR MATH BOOK(S)	0.384	0.49	0.459	0.50	0.534	0.50	0.632	0.48	0.723	0.45	0.793	0.41
NUMBER OF GRADES IN SCHOOL	4.918	0.60	4.872	0.61	4.920	0.46	4.902	0.48	4.947	0.37	4.972	0.27
SCHOOL HAD FURNITURE	0.502	0.50	0.582	0.49	0.662	0.47	0.754	0.43	0.819	0.39	0.867	0.34
SCHOOL SERVED FREE FOOD	0.091	0.29	0.150	0.36	0.221	0.42	0.337	0.47	0.398	0.49	0.467	0.49
NUMBER OF TEACHERS IN SCHOOL	3.472	6.22	3.911	5.67	4.599	5.65	6.066	5.94	7.020	6.28	8.263	7.12

Table B.4

Determinants of School Attainment Levels:
OLS Regression Results For Males, By Birth Cohort

Birth cohort:	1925-1939		1940-1944		1945-1949		1950-1954		1955-1959		1960-1966	
Variable	Estimated coefficient	t value	Estimated coefficient	t value	Estimated coefficient	t value	Estimated coefficient	t value	Estimated coefficient	t value	Estimated coefficient	t value
INTERCEPT	1.864	7.08	2.170	4.93	2.248	5.00	4.386	8.90	4.465	9.14	4.501	12.53
MOTHER'S YEARS OF SCHOOLING 1/	0.338	7.30	0.356	4.57	0.263	4.05	0.208	3.74	0.272	5.99	0.161	5.18
FATHER'S YEARS OF SCHOOLING 1/	0.382	9.57	0.452	7.40	0.503	8.76	0.451	8.96	0.198	4.50	0.231	8.06
LIVED WITH MOTHER AT AGE 10	0.228	0.89	-0.255	-0.62	0.800	1.44	-0.058	-0.12	0.692	1.58	0.053	0.15
LIVED WITH FATHER AT AGE 10	0.278	1.29	0.867	2.47	0.548	1.61	0.258	0.75	0.189	0.60	0.591	2.49
OCCUPATIONS: 2/												
MOTHER IS A WHITE-COLLAR WORKER	0.042	0.10	0.515	0.86	1.747	3.16	-0.068	-0.13	0.850	2.06	0.931	3.81
MOTHER IS A BLUE-COLLAR WORKER	-0.426	-1.23	-0.984	-1.68	-0.279	-0.52	0.867	1.39	-0.241	-0.52	0.484	1.85
MOTHER HAS NO JOB	0.328	1.59	0.446	1.32	0.754	2.25	0.225	0.69	0.620	2.06	0.523	2.32
FATHER IS A WHITE-COLLAR WORKER	1.388	4.20	1.736	3.63	0.513	1.08	1.580	3.59	1.407	3.58	0.757	2.80
FATHER IS A BLUE-COLLAR WORKER	0.289	1.08	1.125	2.88	0.832	2.10	1.607	4.59	1.336	4.27	1.089	5.10
LIVED IN A CITY AT AGE 8	0.358	0.92	-0.413	-0.73	-0.457	-0.98	-0.054	-0.10	0.808	1.77	-0.540	-1.45
LIVED IN A CITY AT AGE 18	1.499	4.02	2.057	3.96	1.771	3.85	0.698	1.37	0.594	1.37	1.596	4.47
ADJUSTED R2	0.490		0.501		0.46		0.465		0.402		0.405	
F STATISTIC [DEGREES OF FREEDOM]	82.09 [15, 1249]		39.81 [15, 595]		38.21 [15, 638]		42.12 [15, 696]		37.38 [15, 795]		58.18 [15,1200]	

1/ A dummy variable taking on the value of 1 if years of schooling was missing was also included. The estimated coefficients are not reported here.
2/ Omitted category is mother or father is an agricultural worker. Also included in the regressions is a missing data category; results not shown.

Table B.5

Determinants of School Attainment Levels:
OLS Regression Results For Females, By Birth Cohort

Birth cohort:	1925-1939		1940-1944		1945-1949		1950-1954		1955-1959		1960-1966	
Variable	Estimated coefficient	t value	Estimated coefficient	t value	Estimated coefficient	t value	Estimated coefficient	t value	Estimated coefficient	t value	Estimated coefficient	t value
INTERCEPT	-0.448	-2.01	-0.390	-1.06	0.342	0.87	0.736	1.87	2.145	4.98	3.569	9.34
MOTHER'S YEARS OF SCHOOLING 1/	0.490	13.56	0.466	8.19	0.460	7.62	0.442	8.75	0.317	6.44	0.270	8.07
FATHER'S YEARS OF SCHOOLING 1/	0.263	9.23	0.325	6.40	0.362	7.18	0.329	7.17	0.325	7.08	0.201	6.89
LIVED WITH MOTHER AT AGE 10	0.792	3.82	0.868	2.53	0.783	2.08	0.275	0.77	-0.536	-1.33	-0.024	-0.07
LIVED WITH FATHER AT AGE 10	0.199	1.17	0.183	0.67	0.414	1.33	0.541	1.88	1.398	4.53	0.202	0.85
OCCUPATIONS: 2/												
MOTHER IS A WHITE-COLLAR WORKER	0.854	2.48	1.173	2.37	0.903	1.70	0.940	2.20	1.180	2.94	1.053	3.94
MOTHER IS A BLUE-COLLAR WORKER	0.222	0.86	0.460	1.11	-0.052	-0.11	0.144	0.34	0.157	0.38	0.249	0.91
MOTHER HAS NO JOB	0.786	4.90	0.925	3.41	0.360	1.24	0.827	2.97	0.209	0.74	0.608	2.60
FATHER IS A WHITE-COLLAR WORKER	1.078	4.22	0.919	2.23	1.251	2.91	1.958	5.01	1.354	3.59	1.388	4.91
FATHER IS A BLUE-COLLAR WORKER	0.895	4.18	0.168	0.51	0.966	2.76	1.612	4.95	1.279	4.10	1.597	7.17
LIVED IN A CITY AT AGE 8	1.259	3.24	-0.350	-0.69	0.219	0.43	0.077	0.17	0.563	1.26	1.498	3.81
LIVED IN A CITY AT AGE 18	0.363	0.94	2.078	4.31	1.366	2.88	1.607	3.80	1.055	2.54	0.116	0.31
ADJUSTED R2	0.608		0.584		0.553		0.620		0.504		0.491	
F STATISTIC [DEGREES OF FREEDOM]	136.17 [15,1290]		59.82 [15,603]		59.83 [15,699]		87.05 [15,792]		62.43 [15, 891]		83.912 [15,1273]	

1/ A dummy variable taking on the value of 1 if years of schooling was missing was also included. The estimated coefficients are not reported here.

2/ Omitted category is mother or father is an agricultural worker. Also included in the regressions is a missing data category; results not shown.

Table B.6

Determinants of School Attainment Level:
OLS Regression Results For Males Who Ever Attended School, By Birth Cohort

Birth cohort:	1925-1939		1940-1944		1945-1949		1950-1954		1955-1959		1960-1966	
Variable	Estimated coefficient	t value	Estimated coefficient	t value	Estimated coefficient	t value	Estimated coefficient	t value	Estimated coefficient	t value	Estimated coefficient	t value
INTERCEPT	-0.946	-1.82	-0.861	-0.74	-1.692	-1.68	-1.982	-1.45	-2.925	-2.14	-1.220	-1.02
MOTHER'S YEARS OF SCHOOLING 1/	0.288	6.58	0.310	4.13	0.288	4.56	0.208	3.86	0.246	5.49	0.175	5.17
FATHER'S YEARS OF SCHOOLING 1/	0.252	5.70	0.304	4.42	0.277	4.21	0.338	6.53	0.176	4.58	0.102	2.80
LIVED WITH MOTHER AT AGE 10	0.332	1.27	-0.253	-0.64	0.708	1.98	-0.101	-0.23	0.282	0.67	-0.469	-1.20
LIVED WITH FATHER AT AGE 10	0.228	1.05	0.547	1.50	0.445	1.37	0.585	1.76	0.208	0.71	0.446	1.77
OCCUPATIONS: 2/												
MOTHER IS A WHITE-COLLAR WORKER	-0.209	-0.51	0.185	0.28	1.109	2.06	-0.284	-0.64	0.801	2.15	0.539	2.01
MOTHER IS A BLUE-COLLAR WORKER	-0.249	-0.69	-0.546	-0.99	-0.105	-0.20	0.398	0.87	-0.242	-0.68	0.757	2.67
MOTHER HAS NO JOB	0.090	0.44	-0.327	-0.81	0.367	1.18	-0.111	-0.36	0.528	1.87	0.522	2.18
FATHER IS A WHITE-COLLAR WORKER	1.283	4.09	1.467	3.22	0.345	0.76	1.067	2.54	0.989	2.50	0.539	1.85
FATHER IS A BLUE-COLLAR WORKER	-0.229	-0.84	0.634	1.66	0.217	0.65	0.898	2.59	0.976	3.41	0.646	2.78
LIVED IN A CITY AT AGE 8	0.352	0.91	-0.238	-0.44	-0.991	-2.10	0.214	0.43	0.650	1.58	-0.397	-0.99
LIVED IN A CITY AT AGE 18	0.918	2.36	1.123	2.07	1.525	3.52	-0.126	-0.26	0.205	0.46	0.828	2.07
HAD READING AND/OR MATH BOOK(S)	0.542	2.94	0.249	0.83	0.307	1.05	0.583	2.05	0.918	3.28	0.316	1.29
NUMBER OF GRADES IN SCHOOL	0.585	5.48	0.848	4.65	0.955	4.80	1.198	4.81	1.214	4.81	1.342	6.48
SCHOOL HAD FURNITURE	0.425	1.76	0.740	1.81	0.342	0.85	0.627	1.59	0.611	1.68	-0.189	-0.40
SCHOOL SERVED FREE FOOD	-0.191	-0.77	0.523	1.65	0.076	0.28	0.188	0.80	-0.282	-1.27	-0.084	-0.21
NUMBER OF TEACHERS IN SCHOOL												
1 - 3 TEACHERS	0.212	1.66	0.036	0.17	0.278	1.48	0.172	0.94	0.480	2.92	0.411	2.82
4 - 6	0.113	0.51	0.134	0.32	0.089	0.68	0.109	0.24	-0.089	-2.25	-0.010	-2.16
6 +	0.104	0.78	0.062	0.12	0.048	1.16	0.062	0.58	0.018	2.68	0.025	2.58
LAMBDA	0.298	0.88	-1.807	-0.87	-3.002	-2.78	-3.208	-2.41	0.588	0.17	-5.688	-3.78
ADJUSTED R2	0.518		0.521		0.472		0.486		0.480		0.465	
F STATISTIC [DEGREES OF FREEDOM]	48.1 [28, 1049]		25.5 [28, 495]		24.2 [28, 574]		29.1 [28, 680]		30.8 [28, 767]		45.4 [28, 1152]	

1/ A dummy variable taking on the value of 1 if years of schooling was missing was also included. The estimated coefficients are not reported here.

2/ Omitted category is mother or father is an agricultural worker. Also included in the regressions is a missing data category; not

Table B.7

Determinants of School Attainment Level:
OLS Regression Results For Females Who Ever Attended School, By Birth Cohort

Birth cohort:	1925-1939		1940-1944		1945-1949		1950-1954		1955-1959		1960-1966	
Variable	Estimated coefficient	t value	Estimated coefficient	t value	Estimated coefficient	t value	Estimated coefficient	t value	Estimated coefficient	t value	Estimated coefficient	t value
INTERCEPT	-1.756	-2.08	-1.789	-1.28	-0.591	-0.40	-0.145	-0.12	0.994	0.61	0.624	0.38
MOTHER'S YEARS OF SCHOOLING 1/	0.331	7.27	0.301	4.92	0.302	4.66	0.331	6.62	0.213	3.63	0.119	2.60
FATHER'S YEARS OF SCHOOLING 1/	0.128	3.48	0.233	3.62	0.174	2.86	0.143	2.67	0.092	1.50	0.066	1.69
LIVED WITH MOTHER AT AGE 10	0.788	2.46	0.980	2.23	0.695	1.66	0.302	0.82	0.126	0.26	0.041	0.09
LIVED WITH FATHER AT AGE 10	0.153	0.62	0.482	1.41	0.470	1.40	0.823	2.69	0.972	2.55	0.818	1.06
OCCUPATIONS: 2/												
MOTHER IS A WHITE-COLLAR WORKER	0.551	1.26	1.449	2.56	0.757	1.38	0.532	1.22	0.683	1.44	0.534	1.61
MOTHER IS A BLUE-COLLAR WORKER	0.758	1.69	0.571	1.05	-0.347	-0.62	-0.555	-1.28	0.188	0.38	0.041	0.12
MOTHER HAS NO JOB	0.829	3.28	0.882	2.27	0.012	0.04	0.288	0.98	-0.114	-0.34	-0.084	-0.12
FATHER IS A WHITE-COLLAR WORKER	0.950	3.15	0.606	1.87	1.307	3.01	1.704	4.48	0.484	1.10	0.671	1.88
FATHER IS A BLUE-COLLAR WORKER	0.294	1.07	-0.586	-1.49	0.225	0.59	0.757	2.29	-0.504	-1.24	0.209	0.67
LIVED IN A CITY AT AGE 8	0.984	2.02	0.021	0.04	0.732	1.37	-0.319	-0.72	0.027	0.05	1.372	2.92
LIVED IN A CITY AT AGE 18	-0.130	-0.28	0.597	0.98	-0.136	-0.25	0.884	2.07	0.248	0.50	-0.727	-1.57
HAD READING AND/OR MATH BOOK(S)	0.636	2.91	0.602	2.13	0.801	2.98	-0.085	-0.28	1.145	3.45	0.725	2.54
NUMBER OF GRADES IN SCHOOL	0.466	3.82	0.282	1.37	0.523	2.11	0.498	2.25	0.836	2.79	1.138	3.69
SCHOOL HAD FURNITURE	0.410	1.29	0.704	1.86	0.912	1.98	-0.329	-0.71	-0.484	-1.02	0.228	0.55
SCHOOL SERVED FREE FOOD	-0.456	-1.65	0.029	0.09	-0.380	-1.17	0.728	3.14	-0.012	-0.05	-0.054	-0.27
NUMBER OF TEACHERS IN SCHOOL												
1 - 3 TEACHERS	0.290	2.05	0.058	0.28	0.162	0.79	0.510	2.65	0.217	0.94	-0.085	-0.19
4 - 6	0.011	1.88	0.584	1.57	0.118	0.14	0.088	1.65	0.117	0.82	0.089	0.30
6 +	0.081	1.76	0.149	0.37	0.084	0.57	0.108	1.97	0.076	0.58	0.055	0.46
LAMBDA	-0.180	-0.46	-0.192	-0.26	-1.855	-2.38	-2.115	-3.55	-6.217	-5.62	-6.808	-5.62
ADJUSTED R2	0.482		0.533		0.502		0.580		0.506		0.528	
F STATISTIC [DEGREES OF FREEDOM]	31.1 [28, 721]		20.4 [28, 369]		23.5 [28, 490]		39.9 [28, 625]		26.3 [28, 769]		57.4 [28, 1158]	

1/ A dummy variable taking on the value of 1 if years of schooling was missing was also included. The estimated coefficients are not reported here.

2/ Omitted category is mother or father is an agricultural worker. Also included in the regressions is a missing data category; results not shown.

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