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Participation in Schooling

Determinants and Learning Outcomes in Nepal

Participation in Schooling: Determinants and Learning Outcomes in Nepal*

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I. Introduction

Substantial evidence suggests that the level of adult education attained is related to such dimensions of development as individual earnings and employment in the urban labor markets, agricultural productivity, human fertility, and health and nutritional status.¹ Nonetheless, there are relatively few empirical studies of the mechanisms underlying these effects. In order to understand better such mechanisms on development outcomes, this paper uses data from rural Nepal to examine the effects of education on such potentially mediating variables as adult cognitive competencies and attitudes.² A further potentially important consequence of schooling and improved cognitive competence of adults is an increase in the desire for schooling for their children. This paper reports on this and other determinants of school participation, as well as its cognitive consequences.

The article is organized as follows: Section II presents background material concerning the determinants of adult cognitive competencies and attitudes and of child school participation; Section III describes the data; Section IV examines the determinants of adult attitudes and cognitive competencies; and Section V examines the determinants of child school participation. The sixth section summarizes our conclusions.

II. Background

DETERMINANTS OF ADULT COGNITIVE COMPETENCIES

There have been numerous and diverse studies attempting to relate school outcomes to variations in the amount or quality of school in-

puts. The findings of these studies have sometimes been interpreted to imply that schooling does not make a difference. Yet there is growing evidence that the number of years spent in school does affect both adult cognitive competencies and adult attitudes, which, in turn, are determinants of child school participation. Although these studies provide little guidance concerning how to improve the quality of schooling, they do conclusively show the enduring impact of schooling on various dimensions of cognitive capacity. Relatively few of the available empirical studies concerning the effects of years of education are from less developed countries, and one purpose of this paper is to use data from Nepal to help fill this gap.

Two recent reviews have summarized most of the relevant literature. Harnqvist has summarized studies from the United States and Sweden, and Sheffield has summarized studies from a number of low-income countries.³ The overwhelmingly consistent finding of these studies was that years of schooling affect literacy (reading and writing), numeracy, and modernity.⁴

One important shortcoming of the available literature is that, with data gathered only on adults, it is difficult to ascertain the extent to which an observed correlation between completed schooling and cognitive competence may result, in part, from the plausible hypothesis that more innately able individuals would both attend school longer and, in any case, perform better on tests of adult competence. Although it is difficult to assess with complete adequacy the extent to which this hypothesis is correct, by including a test of "ability" along with our other, more achievement-oriented measures, we are able, in part, to control for this effect.

DETERMINANTS OF SCHOOL PARTICIPATION

School participation in Nepal is low for all but primary school males, and total enrollment rates for children 9–15 are well below 20% (table 1). In general, little empirical work on the determinants of school enrollments in less developed countries has been conducted; Birdsall provides a valuable overview of available evidence.⁵ Since male primary school enrollment is now common (though far from universal), much work has recently been directed toward explaining female enrollments. Reviewing these studies, Bowman and Anderson cite five major determinants of female enrollments—ethnic and regional differences, caste differences, paternal occupation, paternal education and attitudinal modernity, and such miscellaneous factors as foreign travel or language usage.⁶ Such factors have also been shown to be related to positive parental attitudes toward schooling for children.

Research on determinants of school participation in Nepal in particular is very limited. The research that does exist suggests that—in

TABLE 1
SCHOOL ATTENDANCE IN NEPAL BY SEX AND SCHOOL LEVEL

	SCHOOL LEVEL		
	Primary	Lower Secondary	Secondary
Age of students (years)	6-8	9-12	13-15
Total population:	1,096,548	1,331,035	771,698
Estimated female	548,274 (50%)	665,512 (50%)	385,849 (50%)
Estimated male	548,274 (50%)	665,512 (50%)	385,849 (50%)
Total enrolled:	769,049	226,639	82,158
Female enrolled	169,640 (22%)	41,788 (18%)	13,598 (17%)
Male enrolled	599,409 (78%)	184,851 (82%)	68,560 (83%)
Total enrollment rate (%):	70	17	10
Female enrollment rate	31	6	4
Male enrollment rate	108	28	17

SOURCE.—Computed from *Nepal: Primary Education—a Subsector Study*, Report no. 135 (Paris: Unesco, October 1978), annexes 1, 2.

addition to the factors cited by Bowman and Anderson—household economic factors, student health and nutritional status,⁷ school availability, and school quality and relevance are all important. In the next subsections we discuss the factors commonly believed to affect school participation, with particular reference to conditions in Nepal.

School Availability

Lack of school supply could arise because there is no school within walking distance, because the available schools are overcrowded, or because the quality of available schooling is low.

Walking distance. School availability in Nepal has increased dramatically in the past 30 years. In 1951, there were 321 primary schools, enrolling less than 1% of eligible children; in 1975, there were 8,708 schools, enrolling 59% of the children;⁸ by 1982, the number of primary schools had risen to 9,404.⁹ Since there are large numbers of primary schools in Nepal, it would seem that distance to school is not a major problem *on the average*. There probably is, however, a substantial minority of primary school-age children in rural areas for whom distance to primary school is a problem. At the lower-secondary level the number of schools drops by more than 75%, and distance to school may therefore be more of a problem. Shrestha reports, however, that, although distance to school was related to school participation in Gorkha District, it was reported by parents in Jumia, Dhankuta, and Chitawan districts to be one of the least important reasons for not sending children to school.¹⁰

Crowding. The average student-to-teacher ratio is low for both

primary and secondary levels (nationally only about 32; in the districts examined in this paper [Bara and Rautahat], 28 and 30). Thus, overcrowding probably poses no problem for most students at either level.

School quality and relevance. Another important problem for primary and lower-secondary schooling, particularly in rural areas, is the students' lack of access to schooling that is relevant to their lives and of a quality sufficient to make attendance worthwhile. In the relatively few studies of determinants of school-leaving behavior in developing countries, the poor quality of teachers has emerged as a principal reason for students' dropping out.¹¹ School quality affects student dropout propensity both directly and indirectly through increasing the incidence of repetition, which itself causes higher dropout rates.

Direct evidence about the quality of learning in Nepal's primary schools is limited. One recent study completed by the Institute of Education,¹² however, suggests that the quality of learning is quite low and reflects the very poor conditions for learning: untrained teachers, insufficient materials, and monotonous teaching methods. Many teachers lack the school-leaving certificate earned after tenth-grade graduation, and perhaps only one-third of all teachers have training beyond the tenth grade. Teaching materials are scarce, although the impressive effort now under way to prepare and distribute textbooks and teachers' guides for all subjects at all grade levels may help to improve the situation. Teaching methods are traditional, with classes dominated by teacher lectures and unembellished readings from textbooks. Students are expected to respond in unison to the teacher's questions, to recite aloud from their texts, and, in general, to memorize. Students are rarely asked to relate the content of their lessons to their own experiences and perceptions and are rarely expected to analyze, synthesize, or consider questions of cause rather than questions of fact. Students are not encouraged to ask questions.¹³

Demand for Schooling

Lack of parental demand for education could arise from out-of-pocket costs for schooling, the opportunity cost of student's time, and/or parental attitudes regarding schooling.

Out-of-pocket costs. These include direct tuition expenses and the cost of books. Under Nepal's New Education System Plan, the government finances all of a primary teacher's salary and three-fourths of that of a lower-secondary teacher, except in remote areas, where all the costs of lower-secondary teachers are borne by the government. It has been estimated that costs to the student for primary education are about Rs 15 per year for copybooks, pencils, and examination fees. The addition of school uniforms, estimated to cost Rs 70 each, increases the direct cost of primary school attendance to Rs 90–Rs 300 annually. The costs to a lower-secondary student are about Rs 78 for

copybooks, pencils, examination fees, and books. Although in remote areas teacher and book costs will be somewhat more subsidized than these numbers would indicate, students in these areas are far less able to afford cash expenditures, as total household cash income in rural Nepal is only Rs 1,500–Rs 2,000 annually. The out-of-pocket cash expenditures can be expected to be a significant barrier to students' access to schooling, particularly at the lower-secondary level. Shrestha found that low family income was the most important reason reported for parents not educating children in the Chitawan District and the next most important reason in the Dhankuta District.¹⁴

Cost of student's time. At both the primary and lower-secondary levels, the time that a rural student spends in school must frequently be at the expense of his or her doing useful work at home.¹⁵ Studies show that the demand for female child labor is higher than the demand for male child labor. Acharya and Bennett report that, in eight representative districts in Nepal, girls aged 5–9 work 3.4 hours per day and that girls aged 10–14 work 7.3 hours per day, which is 50% more than the number of hours that boys in the same age groups work.¹⁶ A study of farm households in Kabre Palanchowk found that 25% of girls and 13% of boys aged 6–14 were employed in farm labor.¹⁷ A study undertaken in Pokhara, Nepal, and reported in Kasaju found that

Youngsters who do not come to school need to work for their parents, . . . need to support their family's economy and . . . cannot complete the school because the number of hours they are required to stay at school does not match with the number of hours they can afford to spend. In a study, "A survey of parental reasons for not sending their children to primary school in Pokhara Town Panchayat Area," Mr. Upadhyya has pointed out the need for a child to work in support of the family as one of the most frequently listed reasons for non-enrollment. The most frequently stated reason, states Mr. Upadhyya, was that the parents did not see any value in educating girls.¹⁸

This finding is confirmed by Shrestha, who reports that the primary reason parents in Jumla, Gorkha, and Dhankuta do not wish to educate their children is that there would be a "lack of supporting members for household."¹⁹ The second most frequently mentioned reason for not educating girls in Jumla, Gorkha, and Chitawan is that "girls are to be given away in marriage."

Attitudes. According to Ministry of Education data, in 1977, only approximately 30% of the age cohort of female children were involved in primary schools. Female school enrollment in rural areas has been shown to be related to parental attitudes, particularly parental conservatism.²⁰ The evidence from Shrestha and Upadhyya suggests that parental conservatism may be one factor that restricts girls' education in Nepal. A recent study of parental attitudes in Dohkha, Bank,

and Kathmandu districts reported that "the general notion of these parents about girls was that girls would not remain an asset to them all along, which implies that higher investment in their education was not warranted from the practical point of view."²¹

THE CAUSAL MODEL

In the present paper, we examine the effects of these factors across three generations. Figure 1 illustrates the causal structure. The variables in boxes A–D are entirely exogenous and assumed to affect second- and third-generation variables in boxes F–H; the variables in box E—first generation landholding and literacy—are also exogenous, but they are separated to clarify the intergenerational structure of this model. The variables in box A—district, caste, and age—and in box E

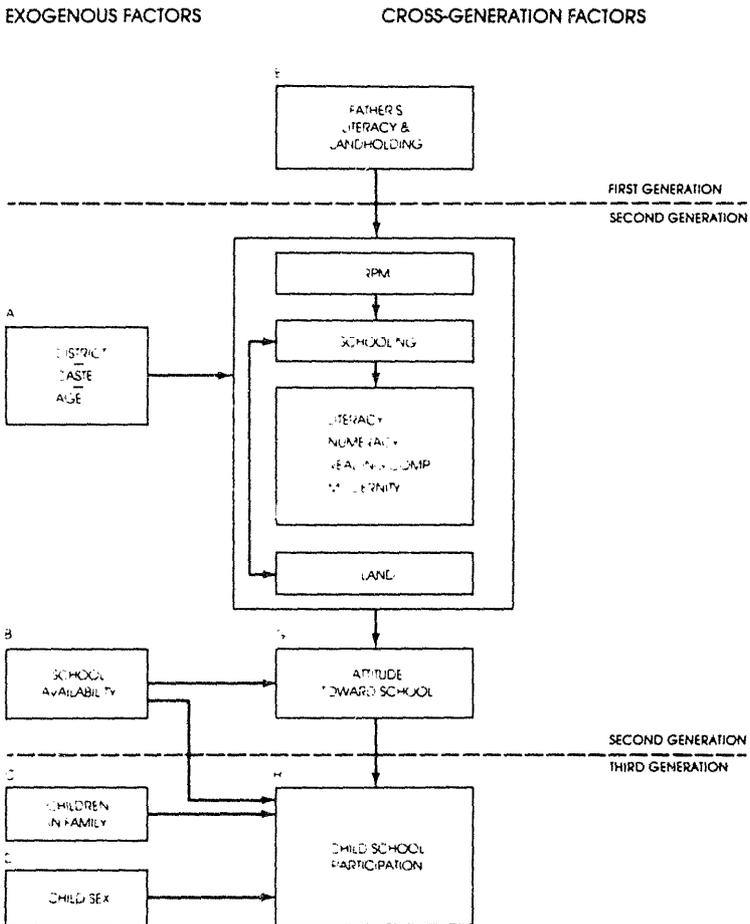


FIG. 1.—A schematic model of the determinants and outcomes of schooling

are assumed to influence "innate" ability as measured by the Raven's Progressive Matrices (RPM) test; this variable, combined with the exogenous variables, is assumed to influence the amount of schooling an individual receives, the amount of land currently owned by the individual, and the adult cognitive competencies of that individual. All the preceding variables taken together, plus the availability of schools (box B), are assumed to influence the adult attitude toward school (box G). Finally, all these variables, taken in combination with the number of children in the household (box C) and the child's sex (box D), are assumed to affect the third-generation's school participation.

III. Data

Data for this analysis were obtained from a survey of 795 households studied as part of a World Bank research project that examines the effects of education and agricultural extension on rural development. The site chosen for the project was determined by the major research objectives concerning the effects of education on agricultural productivity. The households to be interviewed were chosen randomly within each of six *panchayats* in two districts—Bara and Rautahat. A list of owners of all dwellings in each *panchayat* was obtained from the local rural health workers (these lists had been prepared in connection with the health programs). Then, using a three-digit, random number table obtained from the Nepal Central Bureau of Statistics, households to be interviewed were selected randomly within a *panchayat* until a 15% sample of households in each *panchayat* had been chosen (10 extra households per *panchayat* were chosen for replacement).

The study households were visited three times, first in October–November 1977, next in January–March 1978, and last in April–May 1978. Field-workers for the interviewing were recruited by the members of the New ERA research team in Birgunj, Kalaiya (district headquarters of Bara), and Guar (district headquarters of Rautahat). The final field team comprised seven males and seven females, who worked in pairs. All the field-workers spoke both Nepali and Bhojpuri; they translated the questions from Nepali (in which the instruments were written) to Bhojpuri in the field. Table 2 shows the calendar of data collection and indicates the overall nature of the data collected.

Information obtained from the study households at one or more of the three field visits includes data on household characteristics, agricultural productivity, fertility, nutritional status, and various education measures of household members. The availability of primary and secondary schools in the sample villages, as well as the distance to primary and second schools, was obtained in May 1979. This information was available for 23 of the 28 villages studied.

In this paper, data from three generations are analyzed, with first-

TABLE 2

DATA COLLECTION INFORMATION

Round 1 (October–November 1977)	Round 2 (January–March 1978)	Round 3 (April–May 1978)
1. Household roster	1. Household roster (married)	1. Children health and nutrition status revised
2. Household information (including assets, health, and nonfarm income)	2. Education information for members of household only (literacy, numeracy, modernity, Raven's Progressive Matrices)	
3. Children's nutritional and health status	3. Background, employment, and marital status of members of household over age 14	
4. Fertility questions for married women, part of Rautahat	4. Health, nutrition, and family planning knowledge and attitudes 5. Fertility question for married women, part of Rautahat and all of Bara	

generation data on literacy and landholdings used to predict second-generation cognitive competencies and with first- and second-generation data used to predict third-generation school participation. In the former analysis, the record for the head of the household provides the unit of analysis, whereas, in the latter analysis, both household and child records serve as units of analysis. A child was defined as a son or daughter of the household head, a nephew or niece of the household head, a grandchild or great-grandchild of the household head, or an adopted child. These children are the third generation. Younger siblings of the head of the household, aunts or uncles, sisters-in-law, daughters-in-law, servants, and unrelated children were excluded. Third-generation data include a measure of school attendance as a deviation from the average attendance of the child's age cohort and an indicator of the child's sex. The second generation is the child's parent who is the head of the household. Second-generation data include information about this household head: the total number of years of schooling completed, a measure of literacy, a measure of numeracy, a measure of basic ability (Raven's Progressive Matrices Test [RPM]), a measure of attitudinal modernity (a modified version of the short form of the Inkeles Overall Modernity Scale [OM]), a measure of desire for schooling of male children, and the household landholdings. The first generation is the father of the head of the household. First-generation data include the literacy and landholdings of the child's paternal grandfather, as attributed to him by the head of the household. District of residence and caste status are considered exogenous variables. Those variables, analyzed in this paper, are described in table 3; the mean, standard deviation, and sample size for each variable are given in the sections of this paper in which they are analyzed.

The analyses in this paper are restricted to (a) households with children ages 6-16 and for which there are complete data for the heads of the households ($N = 282$); (b) households with children ages 6-16 for which there are complete data sets for the heads of the households who reside in villages for which school availability data were obtained ($N = 213$); (c) all heads of households with complete data sets ($N = 369$); (d) all heads of households with complete data sets who reside in villages for which school availability data were obtained ($N = 285$); (e) children ages 6-16 who reside in households for which there are complete data sets and who reside in villages for which school availability data were obtained ($N = 225$). The determinants of second-generation (adult) cognitive competencies and attitudes will be reported in Section IV of this paper. Section V will present the results of two analyses of the determinants of third-generation (child) school participation: one conducted at the household level and one at the individual child level of analysis.

TABLE 3
DESCRIPTION OF VARIABLES

Variable Name	Variable Description
DIST	District indicator: 1 = Bara; 0 = Rautahat
FLAND	Total land held by head of household's father, in <i>bighas</i> : 1 <i>bigha</i> = 0.676 ha
FLIT	Indicator of head of household's father's literacy: 1 = literate; 0 = not literate
C1	Caste indicator: 1 = head of household is a member of one of the upper castes of Terai origin (e.g., Brahmin, Rajput, Kayastha); 0 = head of household is a member of another caste
AGE	Age of head of household, in years
RPM	Head of household's score on Raven's Progressive Matrices Test (range = 0 to 36)
SYRS	Schooling of head of household, in years of schooling completed
HHLIT	Indicator of literacy of head of household: 1 = literate; 0 = not literate
HHNUM	Numeracy score of head of household, as proportion correct of 14 items
HHCOMP	Reading comprehension score of head of household (range = 0-3)
MOD	Head of household's modernity score (range = 9-18)
SD	Amount of schooling desired for boys in household: 0 = will not educate child; 1 = as long as child wants; 2 = up to high school; 3 = up to intermediate; 4 = up to graduation; 5 = beyond graduation
LAND	Total land owned, in <i>bighas</i> (1 <i>bigha</i> = 0.676 ha)
PG616	Percentage female school-aged (6-16 years) children in household
C06	Number of children 0-6 years in household
PGC	Interaction term: PG616 = C06
SEX	Sex indicator: 1 = male, 0 = female
SEXO	Sex indicator: 1 = female children in households with no other children ages 0-6; 0 = other
SEXC	Sex indicator: 1 = female children in households with other children ages 0-6; 0 = other
SAP	School indicator: 1 = primary school available in village; 0 = no primary school in village
SAS	School indicator: 1 = lower secondary school available in village; 0 = no lower secondary school in village
DISP	Distance to primary school (0 <i>kosh</i> ; 0.5 <i>kosh</i> ; 1.0 <i>kosh</i>)
DISS	Distance to secondary school (0 <i>kosh</i> ; 0.5 <i>kosh</i> ; 1.0 <i>kosh</i>)
PCE1	Percentage of school-aged children (6-16) in household having completed at least 1 year of school
PCE2	Child's school participation as a deviation from the mean years of school completed for his or her age cohort
CS	Schooling indicator: 1 = child completed at least 1 year of school; 0 = other

IV. Determinants of Adult Cognitive Competencies and Attitudes

METHODS OF ANALYSIS

We have ordered our variable recursively, starting with background characteristics of the individual and moving sequentially through the variables that are explained. In this section we discuss only boxes A, B, E, F, and G of figure 1 and analyze data from the sample of all heads of households, whether or not school-age children were in the household.

TABLE 4
MEANS, STANDARD DEVIATIONS, AND SAMPLE SIZES OF VARIABLES ANALYZED
IN SECTION III

VARIABLES	ALL HEADS OF HOUSEHOLDS (N = 369)		HEADS OF HOUSEHOLDS IN VILLAGES WITH SCHOOLS (N = 285)	
	Mean	SD	Mean	SD
District (DIST)	.523	.500	.632	.483
Father literate (FLIT)	.117	.321	.112	.316
Father land (FLAND)	4.414	8.191	4.016	6.186
Caste (C1)	.022	.146	.021	.144
Schooling (SYRS)	1.390	2.990	1.435	3.122
Numeracy (HHNUM)	.672	.226	.673	.229
Reading comp (HHCOMP)	.724	1.565	.765	1.605
Raven's score (RPM)	13.453	4.307	13.491	4.233
Modernity (MOD)	13.621	1.774	13.520	1.728
Land (LAND)	1.913	2.977	1.841	2.491
Age (AGE)	41.713	12.342	41.663	12.139
Attitude toward school (SD)	2.328	1.090	2.291	1.073
Primary school (SAP)	...	...	.653	.477
Secondary school (SAS)	...	...	1.790	.408
Distance to primary school (DISP)	...	...	.279	.409
Distance to secondary school (DISS)	...	...	.798	.568

We analyzed the data using the ordinary least squares linear regression of the *Statistical Package for the Social Sciences (SPSS)*.²² Our tables show the estimated regression coefficients below which, in parentheses, are the *F*-values indicating the statistical significance of the estimated coefficient. The means and standard deviations of the variables used in these analyses are reported in table 4.

RESULTS

The results of some of these analyses are presented in tables 5-7, which show the estimated determinants of the second generation RPM score, schooling, literacy, reading comprehension, numeracy, attitudinal modernity, and attitude toward school. In this section each table will be discussed separately.

RPM Score

The first column of table 5 presents the results of a single multiple regression analysis of the effects of first-generation landholding, first-generation literacy, caste status, and district of residence on second-generation adult RPM score. This regression shows that first-generation landholding and first-generation literacy were both significant determinants of second-generation RPM scores. It is plausi-

TABLE 5
DETERMINANTS OF ADULT "ABILITY" (RPM) AND SCHOOLING (SYRS)

INDEPENDENT VARIABLES	DEPENDENT VARIABLES		
	RPM	SYRS	SYRS
FLAND	.100*** (13.959)	.092*** (29.753)	.082*** (27.138)
FLIT	2.796*** (16.355)	2.780*** (40.724)	1.963*** (23.316)
C1	3.754** (6.618)	4.989*** (29.430)	4.477*** (28.136)
DIST	.984* (5.485)	.476 (3.236)	.283 (1.366)
RPM	...	...	.204*** (46.108)
AGE	...	...	.055*** (30.877)
C	12.089	.302	.091
R ²	.140	.291	.419
Adjusted R ²	.130	.283	.409
N	369	369	369

NOTE.—*F*-statistic in parentheses.

* *P* < .05.

** *P* < .01.

*** *P* < .001.

ble, of course, that, as we have modeled the situation, an individual's RPM score is both an outcome of schooling as well as a determinant of schooling. We thus properly have a simultaneous system, which we have identified in this case by assuming that the coefficient of schooling on RPM is zero. Though this is at best an approximation, it does have justification in that the intention of the RPM is to measure "innate" ability, and, in our sample, this intention seems to be partially fulfilled in that relative differences between males' and females' RPM scores are small compared with, say, numeracy scores.²³

Schooling Attainment

The second and third columns of table 5 report the results of two multiple regression analyses to estimate the determinants of second-generation school attainment. These regressions indicate that school attainment was significantly affected by first-generation landholding and literacy as well as by caste status. The effect of "innate" ability as measured by RPM score was also statistically significant, considered both independently (regression coefficient = .317; *F* = 96.765; *r*² = .207) and in combination with the exogenous variables. Overall, more schooling was attained by younger persons with relatively more literate and landed fathers from the Brahmin, Rajput, and Kayastha castes and with higher "innate" ability. Higher-status caste members on the aver-

TABLE 6
DETERMINANTS OF ADULT LITERACY (HHLIT), READING COMPREHENSION (HHNCOMP), NUMERACY (HHNUM),
AND ATTITUDINAL MODERNITY (MOD)

INDEPENDENT VARIABLE	DEPENDENT VARIABLE							
	HHLIT	HHLIT	HHCOMP	HHCOMP	HHNUM	HHNUM	MOD	MOD
FLAND	...	.002 (1.464)	...	-.006 (.696)	...	-.001 (.693)	...	.025* (5.379)
FLIT	...	.030 (.447)	...	.196 (1.011)	...	.047 (1.763)	...	.865** (9.459)
CI	...	.053 (.337)	...	.468 (1.319)	...	.032 (.190)	...	1.594** (7.359)
DIST	...	.020 (.602)	...	.089 (.625)	...	.013 (.415)	...	-.683** (17.612)
AGE	...	.001 (.369)	...	-.005 (1.281)	...	-.003** (12.997)	...	-.021** (9.184)
SYRS	.116** (758.337)	.113** (417.409)	.383** (422.185)	.373** (232.472)	.036** (105.244)	.025** (31.966)	.222** (60.057)	.096** (7.440)
RPM	...	-.001 (.169)	...	-.008 (.303)	...	.010** (12.725)	...	.040 (3.573)
C	.069	.040	.191	.488	.622	.630	13.312	13.922
R ²	.674	.677	.535	.542	.223	.281	.141	.258
Adjusted R ²	.673	.671	.534	.533	.221	.267	.138	.244
N	369	369	369	369	369	369	369	369

NOTE.—F-statistic in parentheses.

* $P < .05$.

** $P < .001$.

TABLE 7

DETERMINANTS OF SECOND-GENERATION DESIRE FOR THIRD-GENERATION SCHOOLING

INDEPENDENT VARIABLES	ALTERNATIVE SPECIFICATIONS		
	(1)	(2)	(3)
DIST	.000 (.000)	.993 (.527)	.046 (.094)
FLAND	.006 (.382)	.016 (1.601)	.016 (1.476)
FLIT	.501** (6.673)	.403 (3.132)	.409 (3.179)
C1	.089 (.049)	-.223 (.226)	-.262 (.307)
SYRS	-.045 (2.115)	.018 (.235)	.017 (.214)
HHNUM	.224 (.573)	.221 (.456)	.199 (.363)
HHCOM	-.021 (.168)	-.044 (.612)	-.041 (.505)
RAVENS	.002 (.015)	-.009 (.300)	-.008 (.209)
MOD	.072* (3.852)	.062 (1.996)	.070 (2.483)
LAND	.003 (.018)	.082** (7.473)	.081** (7.184)
AGE	.004 (.598)	.002 (.089)	.002 (.100)
SAP			.459 (1.412)
SAS	...	...	.210 (.802)
DISP	...	...	.385 (.713)
DISS	...	...	-.087 (.251)
C	.876	1.065	.261
R ²	.109	.136	.143
Adjusted R ²	.081	.102	.095
N	369	285	285

NOTE.—F-statistics in parentheses.

* $P < .05$.** $P < .001$.

age attained nearly 4.5 more years of school than lower-status caste members; individuals with literate fathers attained nearly 2 more years of schooling than individuals with illiterate fathers; and, finally, older individuals attained fewer years of schooling than younger individuals.

Adult Literacy

Second-generation adult literacy was assumed to be a function of background characteristics, "innate" ability, and schooling. Although first-generation landholding, literacy, and caste had significant effects on

second-generation literacy when assessed independently, these effects operated largely through second-generation school attainment (cols. 1 and 2 of table 6). Likewise, the effects of RPM score on literacy were mediated by schooling. Overall, schooling alone accounted for 67% of the variance in second-generation adult literacy; the inclusion of various exogenous and first-generation factors in the regressions did little to improve the overall estimation.

Adult Reading Comprehension

Second-generation adult reading comprehension was also assumed to be a function of background characteristics, "innate" ability, and schooling. Columns 3 and 4 of table 6 report two of several alternative models of the determinants of second-generation reading comprehension. From these regressions we see that the most significant predictor of reading comprehension is school attainment. The effects of both first-generation literacy and second-generation RPM score, statistically significant when considered independently, disappeared when considered simultaneously with school attainment.

Numeracy

Again, the significant effects of first-generation literacy on second-generation adult numeracy was through the school attainment of the second generation. Second-generation school attainment accounted for 22% of the variance in second-generation numeracy, but, unlike the models for literacy and reading comprehension, RPM score and age were also significant predictors of numeracy (cols. 5 and 6 of table 6).

Attitudinal Modernity

Columns 7 and 8 of table 6 show that the significant effects on second-generation attitudinal modernity of first-generation landholding, first-generation literacy, and caste remained significant when second-generation schooling and RPM score were taken into account. Both second-generation school attainment and RPM score were significant determinants of attitudinal modernity, and, although the independent effect of each was reduced when both were considered simultaneously, each remained a significant predictor of attitudinal modernity.

Attitudes toward Schooling

Second-generation attitudes regarding third-generation schooling were assumed to be determined by both first- and second-generation characteristics and by school availability. These effects were assessed twice, once on the full sample of household heads and once on the sample of household heads from villages for which school availability data were obtained. The results of these analyses are presented in table 7.

From the first column of table 7 we see that, for all household

heads, first-generation literacy and second-generation attitudinal modernity were the only factors related to second-generation attitude toward schooling. The second column of table 7 reports the results of this analysis when it was repeated for the sample household heads residing in villages from which school availability data were obtained. For this second sample, only landholding was a significant determinant of desire for schooling. This difference suggests that the two samples may not be similar.

Column 3 of table 7 presents the coefficients for four indicators of school availability—the availability of primary schools in the village, the availability of secondary schools in the village, the distance to primary school, and the distance to secondary school. It is evident that school availability was not a factor in determining desire for schooling for this sample.

V. Determinants of School Participation

In this section we analyze the determinants of third-generation (child) school attendance. The analysis is conducted first with the data aggregated at the household level and second with the data aggregated at the individual child level. The dependent measures for these analyses differ. At the household level, school participation was operationalized as the proportion of children ages 6–16 who completed at least 1 year of school (PCE 1); the mean value of this indicator for all households having children ages 6–16 was 19.1%. At the individual level, school participation was operationalized two ways: first as the child's deviation from the age-specific mean school attendance for all children in the sample (PCE 2)—these means are shown in table 8 and indicate a low level of school attendance—and, second, as a dichotomous indicator

TABLE 8
AVERAGE YEARS OF SCHOOL ATTENDED
BY AGE COHORT

Age Cohort	Average Years of School Attended
6 years old	.179
7 years old	.273
8 years old	.455
9 years old	.471
10 years old	.616
11 years old	1.621
12 years old	1.086
13 years old	1.133
14 years old	2.154
15 years old	2.292
16 years old	1.125

TABLE 9
MEANS, STANDARD DEVIATIONS, AND SAMPLE SIZES OF VARIABLES ANALYZED
IN SECTION IV

VARIABLES	ALL CHILDREN (N = 443)		CHILDREN IN VILLAGES WITH SCHOOLS (N = 335)	
	Mean	SD	Mean	SD
District (DIST)	.533	.500	.648	.478
Grandfather literate (FLIT)	.102	.302	.090	.286
Grandfather land (FLAND)	4.504	8.777	3.609	4.073
Caste (CI)	.029	.169	.030	.170
Father's schooling (SYRS)	1.519	3.036	1.591	3.206
Father's numeracy (HHNUM)	.680	.239	.681	.243
Father's reading comprehension (HHCOMP)	.847	1.662	.925	1.735
Father's Raven's score (RPM)	13.402	4.237	13.481	4.304
Father's modernity (MOD)	13.529	1.697	13.548	1.679
Father's land (LAND)	2.213	3.488	1.936	1.985
Father's age (AGE)	43.713	10.779	43.713	10.752
Father's attitude toward school (SD)	2.139	1.112	2.128	1.110
Deviation from age mean school (PCE 2)	-.075	1.699	.088	1.707
Child's sex	.601	.490	.585	.493
Primary school (SAP)	...	...	.633	.483
Secondary school (SAS)	...	...	.203	.403
Distance to primary school (DISP)	...	...	.300	.421
Distance to secondary school (DISS)	...	...	.778	.544

of school participation (CS). The means and standard deviations of the variables used in the following analyses are presented in table 9.

DATA AGGREGATED AT THE HOUSEHOLD LEVEL

Method

Once again we have ordered our variables recursively. Referring back to figure 1, the variables in boxes A, E, and B—school availability—are entirely exogenous and are assumed to affect the variables in boxes F—second-generation cognitive competencies and attitudes—and G—second-generation attitude toward school—both separately and in combination. These variables, taken together with the number of children in the family and the child's sex, are assumed to affect third-generation school participation. These data were also analyzed using the SPSS ordinary least squares regression.

Results

Because of the very low rates of enrollment in our sample, household school participation by children was operationalized as the percentage

TABLE 10
SCHOOL ATTENDANCE IN BARA AND RAUTAHAT DISTRICTS

	SCHOOL LEVEL		
	Primary	Lower Secondary	Secondary
Age of students (years)	6-8	9-12	13-15
Ministry of Education:			
Total population:			
In Bara and Rautahat	52,627	26,679	24,186
Estimated female	26,314	13,339	12,093
Estimated male	26,314	13,339	12,093
Total enrolled:	19,152	4,826	1,872
Female enrolled	2,948 (15%)	480 (10%)	148 (8%)
Male enrolled	16,204 (85%)	4,346 (90%)	1,724 (92%)
Total enrollment rate (%):	36.4	18.1	7.7
Female enrollment rate	11.2	3.6	1.2
Male enrollment rate	61.5	32.6	14.3
New ERA/World Bank:			
Sample:			
In Bara and Rautahat*	355	417	225
Female sample	157	170	109
Male sample	198	247	116
Sample completed some school:	42	74	44
Female	7 (16.7%)	9 (12%)	8 (18.2%)
Male	35 (83.3%)	66 (88.0%)	36 (81.8%)
Female 1 year completion (%)	2.2	2.2	3.6
Male 1 year completion (%)	9.9	15.8	16.0

NOTE.—Comparing Nepal Ministry of Education Data with New ERA/World Bank Survey Data.

* All children in household, by ages 6-8, 9-12, 13-16.

of children in the household, ages 6-16, who completed *any* year of school. This measure provided overall statistics not dissimilar to national statistics for these districts (table 10).

Household determinants. As the first column of table 11 indicates, household children's school participation was determined by the household wealth (as indicated by household landholdings), the schooling attained by household head, the numeracy of the household head, the years of schooling of the household head, the R²M score of the household head, the attitudinal modernity of the household head, the caste of the household, and the percentage of female children. With the exception of the percentage of female children, these effects were positive.

To examine the question of whether rates of female participation in school were affected by the presence of young children in the household, we constructed the interaction term PGC, or the percentage of girls in the household multiplied by the number of children ages 0-6. Introducing this term (which had a statistically significant coefficient

TABLE 11
 HOUSEHOLD CHARACTERISTICS, SECOND-GENERATION COGNITIVE
 COMPETENCIES, ATTITUDES, AND SCHOOL AVAILABILITY AS DETERMINANTS OF
 THIRD-GENERATION SCHOOL PARTICIPATION

INDEPENDENT VARIABLES	ALTERNATIVE SPECIFICATIONS			
	(1)	(2)	(3)	(4)
DIST	4.178 (1.524)	3.492 (1.134)	4.749 (1.461)	3.231 (.521)
LAND	1.679** (8.602)	1.683*** (9.157)	2.773** (8.440)	2.263* (5.489)
AGE	.237 (2.272)	.173 (1.281)	.209 (1.383)	.192 (1.145)
SYRS	1.748* (5.653)	1.343 (3.511)	1.348 (2.610)	1.352 (2.557)
HHNUM	21.777* (6.534)	21.958** (7.105)	22.256* (5.351)	23.160* (5.876)
RPM	1.054* (5.533)	1.086* (6.276)	1.112* (4.886)	1.131* (5.122)
MOD	3.358*** (10.143)	2.558* (6.029)	3.192* (6.540)	2.529* (3.992)
C1	33.607*** (10.454)	33.753*** (11.122)	33.661** (9.298)	36.017** (10.685)
PG616	-.224*** (28.951)	-.128* (3.927)	-.141 (3.618)	-.154* (4.323)
C06	1.732 (.927)	6.073* (5.838)	3.583 (1.536)	4.166 (2.100)
PGC	...	-.097* (5.390)	-.067 (1.828)	-.070 (2.005)
SD	...	6.069*** (16.55)	...	4.303* (6.226)
SAP	...	...	...	1.437 (.114)
SAS	...	...	...	-2.145 (.142)
C	-67.982	-71.986	-71.174	-70.783
R ²	.411	.454	.435	.454
Adjusted R ²	.390	.430	.404	.415
N	282	282	212	212

NOTE.—Dependent variable is percentage of school-aged children in household having completed at least 1 year of school (PCE 1). *F*-statistics in parentheses.

* $P < .05$.

** $P < .01$.

*** $P < .001$.

equal to $-.088$, $F = 4.136$) into the regression dramatically reduced the effect of the percentage of girls in the household on children's school participation, while increasing to statistical significance the effects of children ages 0-6 (coefficient = 5.518 , $F = 4.570$). From this we concluded that girls were being utilized in the household to care for smaller children rather than being encouraged to attend school.

The effects of the cognitive abilities and modern attitudes of the household heads' spouses were estimated in separate equations. These

effects were limited to a positive effect of spouses' RPM score on children's school participation; spouses' modernity was not related to children's school participation.

Attitude toward school effect. The second column of table 11 reports the effects on school participation of entering the respondent's attitude toward schooling into the regression. For heads of households (but not for spouses), attitude toward schooling was worth approximately 5% increased enrollment for each additional level of desired schooling beyond the primary level. Holding attitude toward schooling constant did little to change the relative impact of other household characteristics on household children's school participation.

School availability effect. Two indicators of school availability were used in this analysis: presence or absence of a primary or lower secondary school in the village and the distance to a primary or lower secondary school that served the village, should none be available in the village. As the third column of table 11 indicates, holding household characteristics constant, neither primary nor secondary school availability was found to have a statistically significant effect on children's school participation, though the direction of the observed effect was generally what would be expected. We note, however, that school availability for this sample may be atypical for Nepal as a whole, insofar as 68% of the households were located in villages reported to have primary schools and 20% were located in villages with lower secondary schools. The average distance to primary school was, furthermore, only .26 *kosh*, or about one-quarter mile.

Household characteristics, attitude toward school, and school availability. As the last column of table 11 indicates, when household characteristics, attitude toward school, and school availability were considered simultaneously, the head of household's cognitive abilities and attitudes continued to affect children's school participation, as did the attitude toward schooling. School availability had no effect independent of attitude toward school.

For comparison purposes, it is interesting to note that being in a high caste group—a totally exogenous variable—was worth 36% more children participating in school, while being numerate—a potentially determined variable—was worth 23% for a perfect test, or 1.6% for each correct answer. Being modern was worth 2.5% more children enrolled for each modern response. A positive attitude toward schooling was worth 4.3% more children enrolled for each level of schooling desired beyond the primary level. Assuming that each household with children had four school-aged children, two of which were females, each girl was worth 3.8% fewer children enrolled; if all the school-aged children were female, 15% fewer children would participate in schooling. If primary school availability were a statistically significant factor—

which it was not—a school in the village would be worth only 1.4% more children enrolled.

DATA AGGREGATED AT THE CHILD LEVEL

Method

Determinants of third-generation school participation were identified as a combination of fixed background characteristics, first-generation factors, second-generation factors including a stated desire for third-generation schooling, and school availability. The determinants of school participation at the child level of analysis were estimated in two ways: first, using an ordinary least squares linear multiple regression approach with school participation expressed as a continuous variable, and, second, using a logistic regression with school participation expressed as a dichotomous indicator. For the first analysis, the dependent variable was the child's deviation from the mean years of schooling completed by his or her age cohort.

Results of the Linear Multiple Regression Analyses

Sixty-two different equations testing alternative specifications for the determinants of the child's school participation were estimated. In general, first- and second-generation factors explained about 16% of the variance in third-generation school participation, while third-generation sex explained an additional 4% of the variance. Table 12 reports several of the more interesting specifications.

First-generation effects. The first column in table 12 presents the coefficients for the effects on third-generation school participation of first-generation literacy and landholding, holding constant caste, district of residence, and sex of the child. Although caste is fixed and may be considered exogenous, it is important to note that members of higher castes are substantially more likely to send their children to school; caste alone accounted for 5.1% of the variance in school attendance. First-generation literacy accounted for 5.8% of the variance in third-generation general school participation, while first-generation landholding accounted for another 3.5% of the variance.

Second-generation effects. The second column in table 12 presents the coefficients for the effects on third-generation school participation of first-generation landholdings and literacy and of second-generation RPM score, school attainment, cognitive competencies, landholding, attitudinal modernity, and fixed background characteristics. In column three, the child's sex is also included. The most significant determinant of third-generation school participation was the sex of the child, boys receiving on the average three-quarters of a year more schooling than girls. Although both second-generation RPM score and attitude toward school were significant determinants of third-

TABLE 12
DETERMINANTS OF THIRD-GENERATION SCHOOL PARTICIPATION

INDEPENDENT VARIABLES	ALTERNATIVE SPECIFICATIONS			
	(1)	(2)	(3)	(4)
DIST	.411** (7.863)	.249 (2.887)	.222 (2.293)	.022 (.012)
FLAND	.032*** (13.801)	-.003 (.030)	-.002 (.013)	.043 (3.277)
FLIT	.837*** (10.647)	.465 (3.259)	.426 (2.734)	.206 (.383)
CI	2.277*** (26.027)	1.366** (8.412)	1.315** (7.839)	1.420* (5.442)
SYRS	...	.057 (2.061)	.061 (2.383)	.046 (.880)
HHNUM	...	.799** (5.051)	.665 (3.425)	.474 (1.240)
HHCOMP	...	.011 (.032)	-.002 (.001)	.042 (.343)
RAVENS	...	.049** (5.916)	.051** (6.360)	.049* (4.145)
MOD	...	.066 (1.790)	.053 (1.145)	.083 (1.719)
LAND	...	.064 (2.986)	.065 (3.057)	.061 (1.484)
AGE	...	.011 (2.672)	.010 (2.164)	.010 (1.222)
SD	...	.736*** (25.384)	.142* (4.477)	.051 (.386)
SEX	.687*** (21.098)	...	.773*** (27.864)	.757*** (19.128)
SAP	...	...	...	-.484 (.809)
SAS	...	...	...	.045 (.020)
DISP	...	...	...	-.765 (1.492)
DISS	...	...	...	.280 (1.308)
C	-1.003	-3.559	-3.570	-3.291
R ²	.197	.275	.282	.291
Adjusted R ²	.188	.255	.261	.253
N	443	433	433	335

NOTE.—Dependent variable is child's deviation from age cohort mean school attendance (PCE 2). *F*-statistics in parentheses.

* $P < .05$.

** $P < .01$.

*** $P < .001$.

TABLE 13
MEANS AND STANDARD DEVIATIONS OF SELECTED VARIABLES BY
SCHOOL ATTENDANCE STATUS OF CHILD

VARIABLES	SCHOOL ATTENDEES (N = 69)		SCHOOL NONATTENDEES (N = 361)	
	Mean	SD	Mean	SD
Exogenous:				
District (DIST)	.652	.480	.507	.501
Caste (C1)	.159	.369	.006	.074
First-generation factors:				
Literacy (FLIT)	.275	.450	.064	.245
Landholding (FLAND)	9.969	17.800	3.273	4.531
Second-generation factors:				
Age (AGE)	43.768	11.661	43.859	10.672
Years of schooling (SYRS)	4.449	4.00	.920	2.259
Literacy (HHLIT)	.638	.484	.194	.396
Comprehension (HHCOMP)	1.957	1.818	.612	1.522
Numeracy (HHNUM)	.853	.186	.647	.232
Raven's Progressive Matrices (RPM)	17.087	5.575	12.665	3.536
Landholding (LAND)	4.597	6.947	1.752	2.104
Modernity (MOD)	14.764	2.167	13.278	1.461
Attitude toward schooling (SD)	2.667	1.421	2.002	1.005
Child factors:				
Sex (SEX)	.899	.304	.529	.500

generation school participation, the effects of attitude toward school were markedly reduced when the sex of the child was included in the specification, suggesting that this attitude did not generalize to daughter's schooling and was restricted to attitudes toward son's schooling.

Effects of school availability. Column 4 of table 12 presents the results for the effects of school availability on child school participation for the subsample of children for whom school availability data were obtained. Holding other variables constant, neither the presence or absence of either primary or secondary schools in the village nor the distance to these schools had any effect on child school participation.

Logistic Regression Analysis

For this analysis, the dependent variable (CS) was a dichotomous indicator of whether or not the child had obtained any schooling. The means and standard deviations of selected variables by child schooling status are presented in table 13. Several dozen logistic regressions were run; table 14 reports the results of some of the more interesting ones.

First-generation effects. As was noted in the linear multiple regressions, the first column of table 14 indicates that caste was a statistically significant predictor of child school participation, with members of higher castes being twice as likely to attend school than members of

lower castes. Neither first-generation literacy nor first-generation landholdings were significant predictors of third-generation school participation.

Second-generation effects. With first generation and exogenous variables held constant, the second column of table 14 indicates that parental schooling and modern attitudes were strongly related to child school participation; parental attitudes toward school were not related to child school participation in this analysis.

Other exogenous effects. Columns 3-4 of table 14 report the effects of two other exogenous factors on child school participation: child's sex and school availability. Two variables related to child's sex were created. The first, SEXC, was an indicator that the child was female in a household having other children ages 0-6 years; the second, SEXO, was an indicator that the child was a female in a household with no other small children present.

In columns 3 and 4 of table 14, we see that the effect of being female was consistently negative, with girls 3.5-4.5 times less likely to attend school than boys. Small children in the household decreased the girls' likelihood of attending school, but all girls were less likely to attend school than were boys.

Two variables related to the availability of schools were created; these were similar to those used in the linear multiple regression. The first was whether or not a primary school was available in the village, and the second was, if no primary school was available, the distance to the nearest school. In this analysis, availability of a primary school in the village was not related to school participation.

VI. Summary and Conclusions

In this article we have examined the determinants of adult cognitive competencies and of child school participation in the Terai region of Nepal. Data on three generations from 795 rural farm households were analyzed. Four analyses were conducted: a linear multiple regression analysis of the determinants of adult cognitive competencies and attitudes, a linear multiple regression analysis of the determinants of household child school participation, a linear multiple regression of the determinants of individual child school participation, and a logistic regression of the determinants of child school participation.

The results of these various analyses are highly consistent and may be summarized as follows: (1) first-generation (grandparent) landholdings, literacy, and caste status were significant determinants of second-generation "innate ability" as measured by the Ravens Progressive Matrices (RPM) test; (2) RPM was a significant determinant of second-generation schooling; (3) second-generation schooling was a significant determinant of second-generation literacy, numeracy, reading comprehension, and attitudinal modernity; (4) attitudinal moder-

TABLE 14

LOGISTIC REGRESSION ESTIMATES OF THE DETERMINANTS OF
THIRD-GENERATION SCHOOL PARTICIPATION

INDEPENDENT VARIABLES	ALTERNATIVE SPECIFICATIONS			
	(1)	(2)	(3)	(4)
DIST	-1.345*** (-6.653)	.478 (1.155)	.655 (1.334)	.664 (1.357)
FLIT	.488 (1.034)	.678 (1.241)	-.057 (-.078)	-.106 (-.145)
FLAND	-.030 (-.974)	.111** (2.810)	.079 (1.618)	.097 (1.932)
C1	2.405** (2.757)	1.333 (1.067)	2.917* (2.073)	2.647 (1.889)
AGE	...	-.026 (-1.722)	-.016 (-.850)	-.015 (-.853)
SYRS	...	.231*** (2.962)	.281** (2.778)	-.275** (2.758)
HHNUM	...	.311 (.308)	1.163 (1.033)	1.091 (.979)
RAVENS	...	.036 (.787)	.030 (.558)	.026 (.486)
LAND	...	.039 (.451)	.189 (1.698)	.174 (1.573)
MOD	...	-.211** (-2.611)	-.311** (-3.018)	-.303** (-2.952)
HHCOMP	...	-.065 (-.558)	.140 (.929)	.136 (.912)
SD	...	.124 (.823)	.485* (2.453)	.434* (2.221)
SEXC	...	...	-4.881*** (-4.872)	-4.776*** (-4.773)
SEXO	...	...	-3.415** (-2.623)	-3.451** (-2.651)
SAP	...	...	-.254 (-.576)	
DISF	...	...		-.363 (-.654)
N	326	326	326	326
Log likelihood at convergence	-181.9	-118.9	-89.57	86.51
Likelihood ratio	88.04	214.1	278.8	278.9
df	322	314	311	311

NOTE.—Dependent variable is dichotomous indicator of child schooling (CS). *t*-statistic in parentheses.

* $P < .05$.

** $P < .01$.

*** $P < .001$.

nity was a significant determinant of attitude toward school for all households but not for the subset of households in villages for which school availability data had been obtained; (5) in these latter villages, there was no relationship between school availability and a positive attitude toward school—only household landholding was a determinant of attitude toward school; (6) third-generation child school participation was determined jointly by second-generation landholdings, caste, schooling and numeracy, attitudinal modernity, and the child's sex; (7) girls were significantly less likely to have completed at least 1 year of school than were boys; (8) the presence of small children in the household only slightly decreased girls' chances to participate in school; (9) school availability had no effect on child school participation.

Data from the same households shed light on two other important determinants and outcomes of school. Moock and Leslie found that child nutritional status was positively and significantly related to male and female school enrollment and to male grade attainment.²⁴ Jamison and Moock found that grade attainment and numeracy improved the efficiency of rural farmers by economically meaningful amounts.²⁵ A completely parallel study conducted at the same time in Thailand found generally similar results, with only one or two exceptions, most notably that schooling and ability affected parental aspirations for children's schooling.²⁶

Notes

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