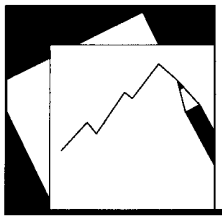
WP/00/42



IMF Working Paper

Educational Choices and Educational Constraints: Evidence from Bolivia

Gabriela Inchauste

INTERNATIONAL MONETARY FUND

 WP/00/42

IMF Working Paper

Fiscal Affairs Department

Educational Choices and Educational Constraints: Evidence from Bolivia

Prepared by Gabriela Inchauste [1]

Authorized for distribution by Sanjeev Gupta

March 2000

Abstract

Recent efforts at poverty alleviation emphasize increasing government spending on education. However, even if spending were perfectly targeted, it is not evident that spending by itself will lead to higher educational attainment. Bolivian household data is used in this paper to ascertain the probability of an individual quitting school due to financial or other reasons. Simulations show that government cash transfers can help to improve educational attainment somewhat. However, nonmonetary limitations must also be addressed if educational attainment is to improve significantly, in particular, for indigenous women who have the lowest levels of education in the country.

JEL Classification Numbers: I20, H52

Keywords: Education, cash transfers, education spending, hazard model, Bolivia

Author's E-Mail Address: minchauste@imf.org

[1] The author is grateful to Sanjeev Gupta, Daniel Slesnick, Daniel Hamermesh, Gerald Oettinger and Eva Gutierrez for helpful comments on earlier drafts of this paper. All errors and omissions are the author's sole responsibility.

Contents Page

I. INTRODUCTION

Recent international efforts at poverty alleviation place an emphasis on increasing government spending in education. However, the link between government spending and increased levels of education is not direct. Even if spending is completely efficient and well targeted, it is not evident that more spending on education would by itself lead to an increase in educational levels. Bolivia is a prime example of a country that has had a stable macroeconomic environment over the past 15 years. It has adopted important structural measures to liberalize its economy, improve public sector management, reform public administration, and more recently, increase its social spending, particularly on education. Nevertheless, despite some progress, social indicators continue to lag with respect to other Latin American countries, and poverty and inequality remain widespread.

The analysis undertaken here uses household data to find the determinants of educational attainment in Bolivia, given individual characteristics and constraints. The estimates are then used to simulate whether a government cash transfer would substantially increase educational attainment for different types of individuals. As shown in the results, a cash transfer by itself, although helpful, is not enough to make a large difference in the educational attainment of the Bolivians, and particularly for indigenous women, who are the ones with the lowest levels of education. The implication is that government spending on education must be accompanied by other programs to address nonmonetary constraints that individuals face in their decisions to attend school.

Becker (1967) postulated that individuals will continue to go to school until the marginal benefit of an additional year of education equals the marginal financing cost. This theoretical framework has been used extensively, but the link between optimal educational attainment and the observed level of schooling was only recently made by Card (1994). He contends that individuals with low levels of education either have low abilities, and therefore their marginal benefit from additional schooling is lower than average, or they have high marginal financing costs such that they are unable to continue with their education. In most data sets, these two groups of people are indistinguishable because the outcome—the actual level of education—is all that is observable.

What makes this study different from previous studies? Empirical studies for developing countries include analyses of the probability of school attendance (Jensen and Skyt Nielsen 1996), analyses of educational expenditures (Chishti and Lodhi, 1988), and analyses of the opportunity costs of going to school (Rosenzweig and Evenson, 1977). However, none of these studies make an explicit differentiation between individuals who have a choice in their years of education and individuals who do not. The Bolivian household survey permits this distinction because all individuals no longer in school are asked to explain why this is so. Using this information, constrained and unconstrained individuals can be distinguished. Once this differentiation is made, the probability of quitting school at every point in time, conditional on being constrained, can be estimated. The results are then used to simulate whether a government cash transfer can increase the educational level of individuals.

The rest of the paper is structured as follows: first the theoretical model is specified, followed by some basic information on the Bolivian case. This is important because compulsory schooling is not enforced in Bolivia, thus increasing the number of people who are able to choose to continue or quit school. Next, an unconditional hazard model for the probability of an individual's quitting school is presented, followed by summary statistics that illustrate the definition of "constraint" based on the data at hand. Finally, the estimation and simulation results are discussed, followed by concluding remarks.

II. THEORETICAL MODEL

What is the optimal schooling for an individual? Becker (1967) develops a model that suggests that the optimal investment in human capital is different for every individual, according to her background and capabilities. A variant of the model posed by Becker and formalized by Card (1994) is presented next, followed by an explanation of how this model can be used to estimate the determinants of the amount of time a person remains in school.

Suppose individuals maximize utility over average earnings per year (y) and human capital (H):

$$\text{Max } U(y,H) = \log(y) - \phi(H)$$

where ϕ is an increasing convex function representing the cost of acquiring additional human capital. Further, assume that earnings are a function of the level of human capital: $y = g(H)$

The first-order condition for the optimal level of human capital equates the marginal rate of return on human capital to the marginal cost:

$$(1) \quad \frac{g'(H)}{g(H)} = \phi'(H)$$

Following Card, it is assumed that the marginal return and the marginal cost to human capital investment are linear functions with person-specific intercepts and homogenous slopes. Marginal returns are specified as:

$$(2a) \quad \frac{g'(H)}{g(H)} = b_i - k_1 H \qquad k_1 \geq 0$$

where b_i reflects individual-specific differences in returns to schooling. This can be interpreted roughly as the variation in ability. Marginal costs are specified as:

$$(2b) \quad \phi'(H) = r_i + k_2 H \qquad k_2 \geq 0$$

where r_i varies because individuals have different rates of substitution between schooling and future earnings. Alternatively, this can be interpreted as access to funds, or the opportunity cost of human capital investment. Setting (2a) equal to (2b), the optimal level of human capital is:

$$(3)\ H_i^* = \frac{b_i - r_i}{k_1 + k_2}$$

Graphically, the demand for investment in human capital represents the marginal benefit measured by the rate of return for a particular person for each additional dollar invested. As shown in Figure 1, the demand schedule is downward sloping because there are diminishing returns owing to limited capabilities and time. The supply of human capital represents the effective marginal financing cost of each additional dollar invested in human capital. It is upward sloping because cheaper sources are rationed, and if the cheapest source is unavailable then individuals skip to the next cheapest source of financing. The cheapest source to the investor is in the form of gifts, and the most expensive is in the form of borrowing at high interest rates. Differences in total amounts invested in human capital will vary with personal characteristics due to differences in the rate of return obtainable and in financing constraints.

Now suppose the individual faces a binding constraint in r, for example, because she has limited access to funds, or high opportunity costs make it prohibitive to attain additional education. As shown in Figure 1, the marginal cost curve becomes a vertical line, such that the equilibrium level of human capital investment is lower than the original equilibrium ($H<H^*$). Formally, the constrained marginal cost function has $k_2=0$ and the marginal cost function is $\phi(H)= \bar{r}$. As a result, in equilibrium: $\overline{H}_i = \frac{b_i - \bar{r}}{k_1} < H^*$. In household data, this constrained level of education is observed along with the educational levels for those who face no constraint. Therefore, the empirical problem is that individuals who "choose" their educational level according to their abilities and those facing a constraint are indistinguishable.

For example, consider when both supply and demand conditions vary simultaneously. As a result, two individuals with different marginal costs and returns can invest the same amount in human capital. As shown in Figure 2, given a chosen level of human capital investment (h), it is impossible to identify the supply and demand curves, nor can the equilibrium marginal rate of return be identified. Persons with higher financing opportunities (S_2) will choose to have the same amount of human capital as those with fewer opportunities (S_1) if the former also have lower abilities (D_2). As a result, Becker argues that "the appropriate statistical procedure is a simultaneous equation model that would identify the opportunities and capacities functions, including the effects on both functions of background and human

Figure 1: Investment in Human Capital

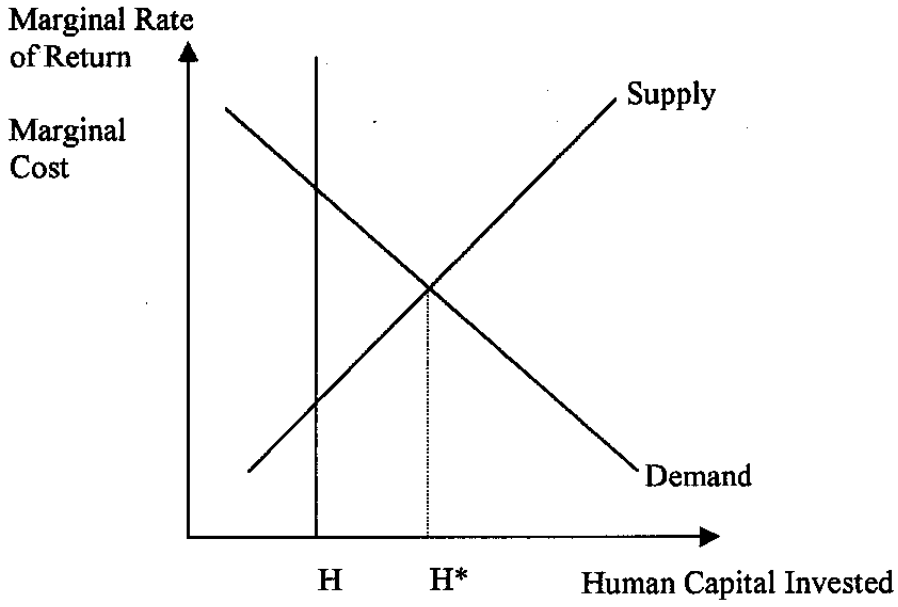
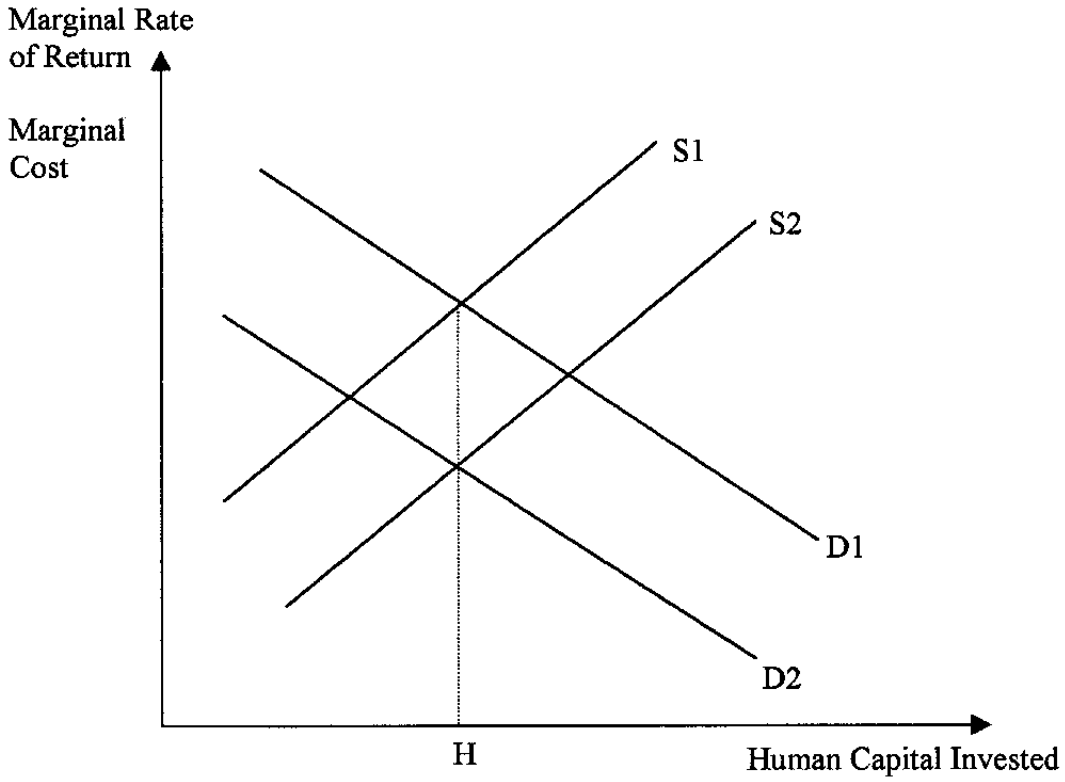


Figure 2: Human Capital Investment: Changes in Demand and Supply



capital accumulation."[2] In practice, this is difficult because typical data do not contain the necessary information on variables that will shift these curves. Ideally, the model would be specified as:

$$r_d = a + bH + gP + u$$
$$r_s = \alpha + \beta H + \gamma B + v$$
$$r_s = r_d$$

where r_d is the marginal rate of return of human capital accumulation H, and r_s is the marginal cost of financing it. Further, B is a vector of exogenous background variables, P is a vector of variables approximating the person's psychic and mental capabilities, and u and v are disturbance terms that are uncorrelated with each other.

Instead of estimating this as a system of equations and attempting to find data for r_s and r_d, this paper contends that the reduced form version can be estimated. Moreover, human capital accumulation can be estimated as a function of background variables, conditional on being constrained in educational choices.

$$H = f(B, P, u, v/\text{constraints})$$

Assuming H can be approximated by the number of years a person attends an educational institution, one can formulate a hazard model where the probability of leaving school at time t is a function of background variables and individual characteristics, weighted by the probability of being constrained.[3]

III. CHARACTERISTICS: BOLIVIA

Educational attainment in Bolivia is well below Latin American standards, particularly for women in rural areas (Table 1). During the 1980s there was a sharp decline in returns to schooling, but by the early 1990s this trend started to reverse, and the average return to schooling has been stable since. The returns to primary schooling are the highest, while those to secondary schooling the lowest. However, the primary school enrollment rate remains low partly because children usually work the same number of hours as adults, for about one-third

[2] See Becker (1967), p. 134.

[3] In practice, the educational level observed for constrained people is also the level corresponding to the demand curve at the constraint. As a result, the marginal rate of return to education. could also be identied for these individuals.

Table 1. Social Indicators and Government Social Expenditure

	1990	1991	1992	1993	1994	1995	1996	1997	1998	Latin America and Carribbean 1998	Lower-Middle Income 1998
Life expectancy at birth (years)									62	70	68
Mortality rate, infant (per 1,000 live births)	81		75		75			66	67	32	38
Child malnutrition (percent of children under 5)									9	8	...
Maternal mortality rate (per 100,000 live births)					390						
Physicians (per 1,000 people)	0.45			0.42							
Hospital beds (per 1,000 people)					1.0				1.4		
Safe water (percent of population with access)	52.8			56		70			60	75	75
Illiteracy (5 of population age 15+)									17	13	14
Net enrollment rate (percent of total)	76.9			81.9			86.5	87.3			
School enrollment, preprimary (percent of gross)	32.0	33.6	35.4	37.1	38.6	40.2	41.5				
School enrollment, primary, female (percent of gross)	90.4								87	...	100
School enrollment, primary, male (percent of gross)	99.0								95	...	105
School enrollment, tertiary (percent of gross)	22.2	22.6	23.0	23.2	23.4	23.7	24.0				
Total expenditure as a percent of GDP	25.3	26.8	28.3	28.7	28.2	27.7	27.7	27.9	28.8	...	...
Education expenditure as a percent of GDP	3.5	4.1	4.5	5.3	5.6	5.3	5.7	6.0	5.7	...	...
Current education expenditure (percent of GDP)	3.5	4.0	4.4	5.2	5.4	4.7	4.8	5.0	4.9	...	...
Health expenditure as a percent of GDP	1.7	1.8	2.2	2.2	1.8	3.1	3.3	3.3	3.3	...	...
Current health expenditure (percent of GDP)	1.4	1.6	1.8	1.9	1.4	2.7	2.9	2.9	2.9	...	...

Source: World Bank Country at a Glance; Bolivian authorities; and IMF staff estimates.

of the minimum wage.[4] The contribution of child income to total household income was approximately 20 percent in 1993.

Bolivian law prohibits the employment of children under the age of 18 in "dangerous, unhealthy or immoral work" and schooling is "compulsory" through age 13. However, the labor code is ambiguous on the conditions of employment for minors aged 14 through 17, and allows apprenticeship for children between 12 and 14, which conflicts with school attendance. Although the Ministry of Labor is responsible for enforcing child labor provisions, it seldom does; children can be found on urban streets at all times of the day, hawking goods, shining shoes, and calling out from buses for passengers.[5]

Other factors leading to low attendance are the direct and indirect costs of schooling. Public schools are free, but there are corollary expenses such as registration fees, report card fees, the cost of uniforms, school supplies, and transportation expenses. In urban areas these direct costs have been estimated at about US$124 per year. There are also indirect or opportunity costs, which can be measured as the forgone wage. Although it is difficult to estimate the value of this forgone wage, one can impute it by considering the wage of children with similar demographic characteristics (estimated at US$17 per month for seven- to ten-year-old children). Finally, there may be nonmonetary constraints, such as the lack of childcare facilities, and cultural beliefs or prejudices. These considerations will be analyzed below, allowing for the possibility that people are somehow constrained in their educational choices.

IV. Econometric Model

A hazard model is used which estimates the probability of quitting school at period t+1, given that the individual has been in school for t periods. This hazard model is weighted by the probability of being constrained. The exact definition of "constraint" is data driven; sensitivity to the definition is presented in the Appendix. The baseline definition specifies as constrained those individuals who claim to have no financial resources, those for whom the educational establishments are too distant, those who have family or other problems, and those with nine years of education or less who do not attend school because they must work.[6]

---

[4] See World Bank (1996). This finding is true for other developing countries. For example, Mergos (1992) finds a positive and important economic contribution of children to farm households in the Philippines, and Rosenzweig and Evenson (1977) derive similar findings in India.

[5] According to the International Child Defense Organization, 500,000 Bolivian children worked in various activities in 1996 (Erbol News Service, 1996). Considering the total population was approximately 7 million, this is quite a large number.

[6] Nine years of education coincides with the legal requirement that children go to school until age 13.

Let the desired number of school years for individual i be equal to T_i^*, and the observed number of school years be equal to t_i. For unconstrained individuals who are out of school, we observe:

$$(1)\quad t_i = T_i^*$$

These are completed spells, where we know the person considers herself done with schooling and is therefore unconstrained. On the other hand, people who are still in school have censored spells:

$$(2)\quad t_i < T_i^*$$

Individuals still attending school are assumed to be unconstrained at the time of the interview. In contrast, all constrained spells correspond to individuals who are no longer in school for financial or other reasons.[7] These spells are complete because the individual is no longer in school, and their observed level of education is below their desired level:

$$(3)\quad t_i < T_i^*$$

Next, assume that the probability of being constrained follows a logistic distribution,[8] such that the probability of being constrained is given by:

$$(4)\quad \text{P(constrained)} = \frac{e^{\beta' X}}{1 + e^{\beta' X}}$$

where X contains personal and household variables. Further, for simplicity let $f_i(t_i)$ be the Weibull density function for person i such that :

$$(5)\qquad f(t) = \lambda_i \alpha t^{\alpha-1} \exp(-\lambda_i t^{\alpha})$$

The complement of the cumulative density function F(t) is the survival function (Greene, 1993)[9]:

---

[7] Unfortunately, since this is cross-sectional data, other information on financial constraints to corroborate that these self-identified people were in fact financially constrained when they quit school is unavailable. Using panel data, one could go back to the point in time when each individual left school and look at their financial situation at that time.

[8] The logit model is chosen for its mathematical simplicity compared to the probit model, even though they typically yield similar estimates.

[9] One could employ a proportional hazard model and do away with distributional assumptions; however this type of modification is relegated to future research (see Amemiya, 1985 or Maddala, 1983).

$$(6) \qquad S(t) = P(T \geq t) = \exp(-\lambda_i t^{\alpha})$$

where α, the time dependence parameter, indicates whether leaving school varies as the person obtains higher levels of education. S(t) is the survival function indicating the probability that the child will stay in school for an additional year, given she has completed t years. This is a reasonably flexible distribution because it does not assume that the probability of leaving school is the same in every period. Furthermore, let:

$$(6) \ \lambda_i = \exp(Z'_i \delta) \text{ for unconstrained individuals}$$

$$(7) \ \phi_i = \exp(Z'_i \gamma) \text{ for constrained individuals}$$

where ϕ and λ are the hazard rates for constrained and unconstrained individuals respectively, Z_i is a vector of household and individual characteristics, and the parameters for the constrained and unconstrained hazards are not necessarily equal ($\delta \neq \gamma$). This specification allows the effects of the covariates on the hazard of leaving school to vary between those who are constrained and those who are unconstrained.

The weighted likelihood function is then:

L = P(unconstrained)*[Time in school |unconstrained] +
P(constrained)*[Time in school |constrained].

Mathematically:

$$(8) \ L = \prod_{i=1}^{N}[1 - P(c=1)] * \prod_{i=1}^{n} f_i(t_i = T_i^*) \prod_{i=n+1}^{N} S_i(t_i < T_i^*) + \prod_{i=N+1}^{M} P(c=1) * \prod_{i=N+1}^{M} f_i(t_i \neq T_i^*) .$$

Observations 1,...,N are unconstrained individuals such that 1,...,n of them do not plan to pursue higher academic training because their spells are complete. Observations n+1,....,N are truncated spells where we observe the individual only up to time $t_i < T_i^*$. Observations N+1,...,M are constrained individuals, all of whom have completed spells. Equation (8) can then be rewritten in final estimable form as:

$$(9) \ L = \prod_{i=1}^{N} \frac{1}{1+e^{\beta' X_i}} * \prod_{i=1}^{n} \lambda_i \alpha_1 t^{\alpha_1 - 1} \exp(-\lambda_i t^{\alpha_1}) \prod_{i=n+1}^{N} \exp(-\lambda_i t^{\alpha_1}) +$$
$$\prod_{i=N+1}^{M} \frac{e^{\beta' X_i}}{1+e^{\beta' X_i}} * \prod_{i=N+1}^{M} \phi_i \alpha_2 t^{\alpha_2 - 1} \exp(-\phi_i t^{\alpha_2})$$

Maximization of this function will yield the median length of time spent in school. More interestingly, the results will show the impact of each variable in Z_i on how long an individual stays in school, given her constraints, and of X_i on whether or not the individual is constrained. Moreover, one can perform simulations using the estimated parameters.

Both X_i and Z_i are vectors of household and individual characteristics that include the individual's gender, marital status, ethnicity,[10] and a dummy equaling one if the individual is the head of household. They also contain the individual's available unearned income, which includes own unearned income and all other household members' earned and unearned income.[11] Since the probability of being constrained and the hazard of leaving school occur simultaneously, the only way to find the influence of each variable on the observable outcome is if there are other variables that identify the hazard of leaving school from the probability of being constrained.

In particular, the identifying variables in X_i are those that influence the probability of being constrained but not the desired level of schooling. These include dummy variables for the presence of one child under age six, for more than one child under that age, and dummies for one or more children between ages six and thirteen. These child dummies will account for the fact that childcare may stand in the way of further educational achievement, both for the adults in the household and for older children, but not necessarily alter the desire to continue studying. In addition, the ratio of children to adults in the household is included to account for the fact that more dependents require greater attention and higher household income, which may also stand in the way of educational goals. The hazard of quitting school must be identified by a variable that has no influence on the probability of being constrained. For this purpose, I use a dummy equaling one if the person had to repeat one or more grades and zero if there were no repeated grades. This dummy variable is meant to act as a proxy for school performance;[12] poor performance may lead to higher dropout probabilities inasmuch the marginal returns to additional schooling are likely to be lower than the marginal costs of repeating a grade. As a result, it affects the hazard of leaving school, but not the probability of being constrained.

V. Data and Summary Statistics

The data used in this study are taken from the 1993 Bolivian Urban Household Survey conducted by the Bolivian National Statistics Institute in conjunction with the World Bank. The survey includes the nine most important urban centers,[13] covering 4,297 randomly chosen households for a total of 20,160 observations. The sample was constructed as follows:

---

[10] The main distinction for the ethnicity variable is between indigenous and nonindigenous people. The survey asks people about the languages they commonly speak. As a result, indigenous people are defined with a dummy equaling one if the individual speaks one or more of the native languages, even if she speaks Spanish as well. This is the same approach adopted by Psacharopoulos (1993) using similar Bolivian data. Since few nonindigenous people speak the native languages, this proxy is expected to be fairly good.

[11] Own earnings are excluded to avoid endogeneity problems.

[12] The hypothesis that grade repetition is dependent on performance is consistent with other studies on educational performance for the poor in Latin American countries (Harbison and Hanushek, 1992).

[13] Eight of these are state capital cities.

children under age five are excluded because they have not yet started school, and therefore judgments about their educational constraints are meaningless. Further, households that contain members who work but did not report their earnings are excluded.[14] Finally, domestic workers living at their place of work are excluded because their behavior is likely to be independent of the household in which they live.[15] Once these restrictions are specified, the sample contains 17,434 individuals.

More men are studying, and on average they have one more year of education than women (Table 2). A greater percentage of women have no education or only primary school education, whereas a greater percentage of men have completed high school or have some sort of university education. Not surprisingly, married women have less education than married men. More striking is the difference between the indigenous and nonindigenous populations. In particular, indigenous women have the lowest educational attainment, with very few of them attaining a high school degree and even fewer attaining a postsecondary education. Note that 20.6 percent of indigenous women have no education, compared to 11 percent of nonindigenous women (Figures 3–6). Finally, the educational profiles for nonindigenous men and women look relatively similar.

A. Constrained and Unconstrained Individuals

How can one differentiate between individuals who are somehow limited in their choice of education and those who choose how long they wish to remain in school? The Bolivian survey asked all individuals whether they attended some sort of educational establishment. Those who responded negatively were then asked why they did not. Of these, 26 percent do not attend because of work, 7 percent because of lack of resources, 0.2 percent because of distance from educational establishments, 19 percent because of age, 14 percent because of family problems, 3 percent because of other problems, and 11 percent because of completed schooling. Finally, 19 percent did not respond because they were under four years old.

Based on statistics for people in each group, several increasingly narrow definitions of "constraint" are formulated, but the results do not differ much with the definition of constraint. The results presented here are based on a definition which incorporates the following information. First, note that those who say they do not go to school because of age are much older than the average individual. These individuals have two years of education less than the average educational level, and higher unearned-income receipts. This information leads to the assumption that these individuals belong to an older generation, where expectations for educational attainment were lower and were therefore not constrained at the time of the interview. People who claimed to have family problems or other problems

[14] There are only two households that were excluded for lack of income information.

[15] There are a total of 308 domestic workers in the population. When included in the estimation procedure, the results are not significantly different from those presented here.

Table 2. Sample of School-Age Men and Women

Variable	All Sample Mean	All Sample Standard Deviation	Men Mean	Men Standard Deviation	Women Mean	Women Standard Deviation
Head	0.25	0.43	0.41	0.49	0.09	0.29
Married	0.40	0.49	0.41	0.49	0.39	0.49
Indigenous	0.35	0.48	0.34	0.47	0.36	0.48
Job holder	0.42	0.49	0.50	0.50	0.34	0.47
Illiterate	0.11	0.31	0.08	0.27	0.13	0.34
Student	0.44	0.50	0.46	0.50	0.42	0.49
No education	0.12	0.32	0.09	0.28	0.14	0.35
Primary	0.30	0.46	0.29	0.45	0.30	0.46
Middle school	0.17	0.38	0.18	0.38	0.17	0.37
High school	0.24	0.43	0.26	0.44	0.23	0.42
Completed high school	0.10	0.31	0.11	0.32	0.10	0.30
Teaching school	0.03	0.16	0.02	0.13	0.03	0.18
University	0.10	0.30	0.13	0.34	0.07	0.26
Technical school	0.05	0.21	0.05	0.22	0.04	0.20
Other education	0.01	0.11	0.01	0.11	0.01	0.10
Years of education	7.71	5.52	8.19	5.47	7.26	5.53
Overall earnings	254.7	803.4	380.0	1,035.3	134.4	454.5
Overall unearned income	57.0	944.5	57.1	882.5	56.8	999.3
Repeated grade once	0.06	0.24	0.06	0.24	0.06	0.24
Repeated grade 2+	0.02	0.14	0.02	0.15	0.02	0.13
Constrained (Defn. 1)	0.25	0.43	0.21	0.41	0.29	0.45
Constrained (Defn. 2)	0.35	0.48	0.35	0.48	0.34	0.47
Available income	1,058	2,414	952	2,528	1,159	2,296
Dummy for 1 child under 6	0.29	0.46	0.29	0.45	0.30	0.46
More than 1 child under 6	0.20	0.40	0.21	0.40	0.20	0.40
One child between 6 and 13	0.29	0.46	0.29	0.46	0.29	0.45
More than 1 child between 6 and 13	0.34	0.47	0.35	0.48	0.34	0.47
Sample	17,434		8,456		8,978	

Source: 1993 Bolivian Household Survey.

Figure 3: Histogram of Educational Achievement for Nonindigenous Men

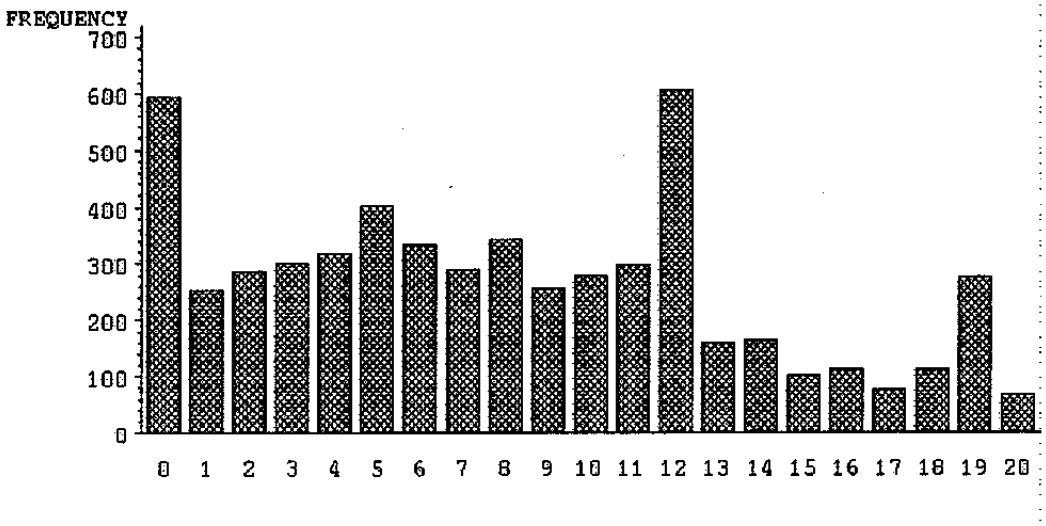


Figure 4: Histogram of Educational Achievement for Indigenous Men

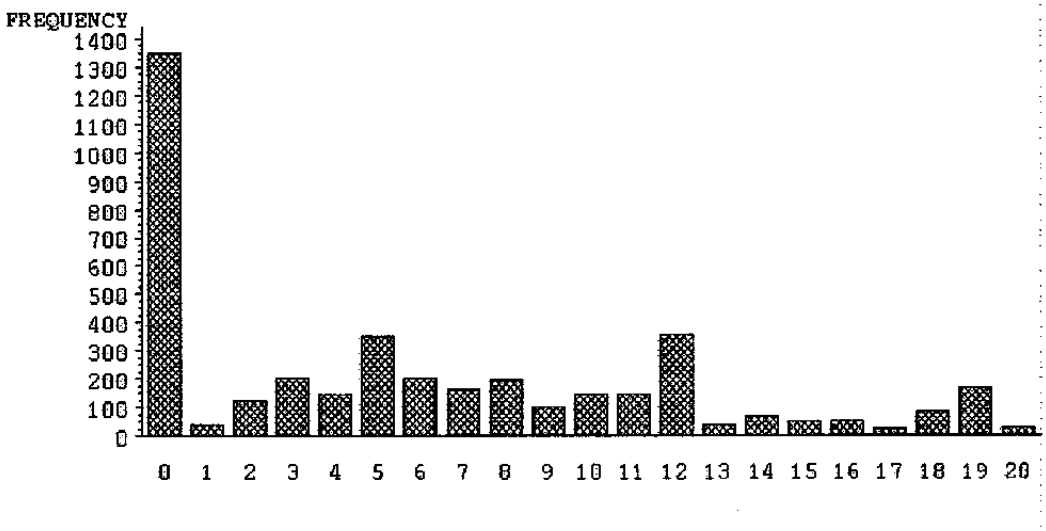


Figure 5: Histogram of Educational Achievement for Nonindigenous Women

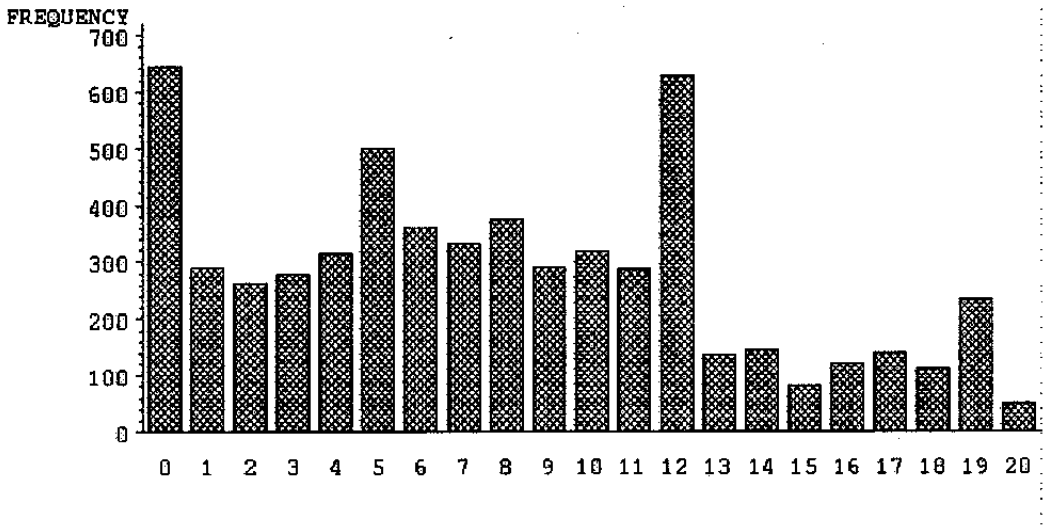
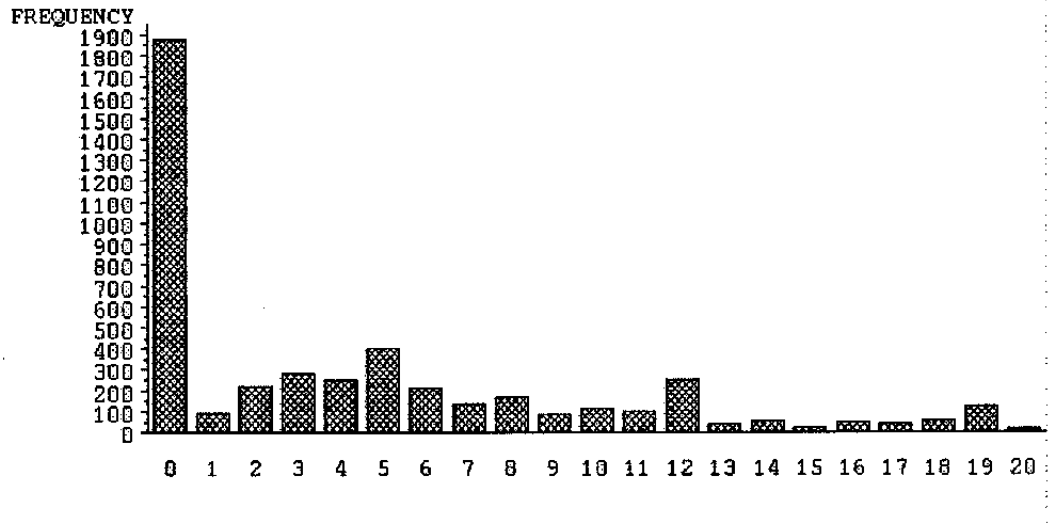


Figure 6: Histogram of Educational Achievement for Indigenous Women



are of all ages, ranging from 5 years to 83 years old, and have lower educational levels than the average. This information leads to the assumption that they are constrained. Finally, people who said they do not go to school because of work are between 7 years and 76 years old and have a higher average educational level than the rest of the sample. In summary, the formulation presented here defines as constrained those individuals who claim to have no resources, those for whom the educational establishments are too far away, those who have family or other problems, and those with nine years of education or less who do not attend school because they must work.[16]

Under this formulation, Table 3 shows that 40 percent of the constrained individuals are male compared to 51 percent of the unconstrained individuals. Moreover, 32 percent of the constrained individuals are heads of household versus 22 percent of the unconstrained individuals, and 51 percent of the constrained individuals are indigenous versus 29 percent of the unconstrained individuals. One can also see that a greater percentage of constrained individuals have children under age six, but both groups have about the same percentage of children between six and thirteen. Finally, the constrained population has an average of 6.3 years of education while the unconstrained group has an average of 8.2 years of education (Table 3). In summary, sample means indicate that a higher percentage of constrained individuals are women, heads of household, Indigenous, and have one or more children under age six.

VI. RESULTS

The probability of being constrained is estimated using the alternative definitions of "constraint." As shown in the appendix, the direction of the estimated coefficients are the same for the different definitions of "constraint" but have slightly different magnitudes. The results presented in Table 4 correspond to the definition specified above.[17] The logit and hazard results shown are the results obtained from the weighted maximum likelihood procedure which simultaneously estimated the probability of being constrained and the hazard of leaving school. The discussion below is separated to consider each of these components in turn.

A. Logit

A logit is estimated to find the probability of being constrained. When interactions between gender and the rest of the independent variables are included, most of the coefficients of the interaction terms are significant. Furthermore, a likelihood ratio test rejects the null hypothesis that the interaction terms are unimportant to the model. As a result, the final model contains interactions with the male dummy. As expected, the probability of being

[16] Nine years of education coincides with the legal requirement that children go to school until age 13.

[17] As a reminder, these are individuals who claim to have no resources, those for whom the educational establishments are too far away, those who have family or other problems, and individuals with nine years of education or less who do not attend school because they must work.

Table 3. Constrained and Unconstrained Individuals

	Unconstrained		Constrained	
Variable	Mean	Standard Deviation	Mean	Standard Deviation
Male	0.51	0.50	0.40	0.49
Extended	0.10	0.31	0.07	0.25
Nonindigenous	0.71	0.45	0.49	0.50
Indigenous	0.29	0.45	0.51	0.50
Unionized	0.09	0.29	0.11	0.31
Illiterate	0.11	0.31	0.11	0.31
Repeated grade	0.10	0.38	0.13	0.43
No education	0.12	0.32	0.11	0.31
Primary	0.27	0.44	0.38	0.49
Middle school	0.15	0.35	0.26	0.44
High school	0.25	0.43	0.21	0.40
Completed high school	0.11	0.31	0.10	0.30
Teaching school	0.03	0.18	0.00	0.07
University	0.13	0.33	0.02	0.15
Technical school	0.06	0.23	0.01	0.10
Other education	0.01	0.12	0.01	0.08
Earnings in 2nd job	838.9	3,040.3	400.6	594.8
Overall earnings	253.9	883.2	257.1	481.2
Unskilled	0.04	0.18	0.12	0.33
Repeated grade once	0.06	0.24	0.07	0.26
Repeated grade 2+	0.02	0.14	0.03	0.16
Constrained (Defn. 1)	0.00	0.00	1.00	0.00
Constrained (Defn. 2)	0.13	0.34	1.00	0.00
Available income	1,142	2,515	805	2,057
Dummy for 1 child under 6	0.29	0.45	0.32	0.47
More than 1 child under 6	0.18	0.38	0.27	0.45
One child between 6 and 13	0.30	0.46	0.28	0.45
More than 1 child between 6 and 13	0.34	0.47	0.33	0.47
Sample	13,098		4,336	

Source: 1993 Bolivian Household Survey.

Table 4. Maximum Likelihood Results

Logit		Constrained Hazard		Unconstrained Hazard	
Constant	-1.8188 ***	Alpha2	1.1444 ***	Alpha1	1.0806 ***
	(0.1190)		(0.0055)		(0.0044)
Male	-0.0818	Constant	-2.5744 ***	Constant	-3.7907 ***
	(0.1553)		(0.0804)		(0.0647)
Head	0.7446 ***	Male	-0.1325 **	Male	-0.7460 ***
	(0.0986)		(0.0531)		(0.0415)
Married	2.0481 ***	Indigenous	0.3687 ***	Indigenous	0.5834 ***
	(0.0584)		(0.0419)		(0.0400)
Indigenous	0.3021 ***	Head	0.1907 ***	Head	0.7279 ***
	(0.0555)		(0.0617)		(0.0446)
Log (available unearned income)	-0.1018 ***	Married	-0.0393	Married	0.6955 ***
	(0.0161)		(0.0425)		(0.0387)
Children per adult ratio	0.6058 ***	Repeated grade once	-0.1123	Repeated grade once	-0.4247 ***
	(0.1151)		(0.0953)		(0.1133)
One child under 6 in the household	0.1878 **	Repeated grade 2+ times	0.1516	Repeated grade 2+ times	-0.1552
	(0.0819)		(0.1362)		(0.1718)
More than one child under 6 in the household	0.2411 *	Log (available unearned income)	-0.0118	Log (available unearned income)	-0.0171 **
	(0.1300)		(0.0101)		(0.0083)
One child between 7 and 12 in the household	0.0256				
	(0.0641)				
More than one child between 7 and 12	0.0708				
	(0.0657)				
Head*male	-0.4087 ***				
	(0.1462)				
Married*male	-1.3151 ***				
	(0.1168)				
Indigenous*male	0.2467 ***				
	(0.0825)				
Children per adults ratio* male	-0.4565 ***				
	(0.1710)				
One child under 6 in the household*male	-0.0659				
	(0.1224)				
More than one child under 6 in the household*male	0.0754				
	(0.1950)				
One child between 7 and 12 * male	0.0434				
	(0.0960)				
More than one child between 7 and 12 *male	0.1575				
	(0.0963)				
Log (available unearned income)*male	0.0095				
	(0.0201)				

Source: 1993 Bolivian Household Survey

Note: Standard Errors are shown in parenthesis. *, **, and *** indicate significance at the 10 percent, 5 percent, and 1 perecent level of significance, respectively.

constrained increases if the individual is a head of household, married, indigenous, or has children under age six, holding everything else constant. People with greater unearned available income are less likely to be constrained. Children between 6 and 13 years old seem to have a negative or insignificant effect on the probability of being constrained, possibly accounted for by the fact that older children help with household chores and in some cases even with additional income, thus reducing constraints. All of these variables when interacted with the male dummy imply that married, indigenous, women who are heads of households and have children are more likely to be constrained than their male counterparts. The probability of being constrained is higher for indigenous women than for indigenous men.[18]

The first column in Table 5 presents the fitted probability values for different types of individuals, evaluated at mean unearned available income. These results indicate that men are less likely to be constrained than women, but this difference is greatest for married nonindigenous women who are heads of household. Indigenous individuals are more likely to be constrained than nonindigenous individuals; but this difference is greatest for single men. Finally, and most interestingly, the probability of being constrained for a married woman is more than two times as large as for a similar single woman. In fact, it appears that marriage is the main reason why women are constrained when compared to their male counterparts, even after accounting for the effect of children.

The second column in Table 5 presents the fitted probability values evaluated at twice the mean available income, thus simulating the effect of a 100 percent increase in available unearned income through a government cash transfer. For each type of individual, the probability of being constrained diminishes with this cash transfer, most strikingly for single men and for nonindigenous single women. A cash transfer has only a slight impact on married women, pointing to the fact that there are other, non-monetary constraints that are more important, in particular for indigenous women.

B. Hazard

The estimated hazard models presented in Table 4 yield the expected results.[19] [20] In order to make these results more apparent, the hazard rate is calculated for individuals with different

[18] The only instance where this is not true is when the definition of constrained includes a large number of working people. Because 72 percent of indigenous men have jobs compared to only 46 percent for indigenous women, a greater percentage of indigenous men are included in the constrained population, thus making the probability of being constrained higher for indigenous men.

[19] Since the Weibull distribution used in the weighted hazard requires positive spell lengths, education is redefined in two ways to account for those individuals who have no education. If education is zero then the spell length is set at 0.1 years of education in the first definition and at 0.01 years of education in the second definition. The estimated coefficients for each specification are basically identical, and are available upon request.

[20] The estimated hazard results for the alternative definitions are available upon request.

Table 5. Fitted Probability Values

	Fitted Values P(cons)	Fitted Simulated Values P(cons)	Percent Change
Nonindigenous single men	0.3427	0.3082	11.21
Indigenous single men	0.4744	0.4353	8.97
Nonindigenous single women	0.3558	0.3185	11.72
Indigenous single women	0.4277	0.3874	10.40
Nonindigenous married men	0.5204	0.4810	8.19
Indigenous married men	0.6526	0.6160	5.94
Nonindigenous married women	0.8107	0.7837	3.45
Indigenous married women	0.8528	0.8306	2.68
Nonndigenous married men--heads	0.6029	0.5646	6.78
Indigenous married men--heads	0.7243	0.6918	4.70
Nonindigenous married women--heads	0.9001	0.8841	1.81
Indigenous married women--heads	0.9242	0.9117	1.38
One child under 6			
Nonindigenous married men--heads	0.6432	0.6062	6.09
Indigenous married men--heads	0.7573	0.7271	4.14
Nonindigenous married women--heads	0.9301	0.9184	1.27
Indigenous married women--heads	0.9474	0.9384	0.96

Source: 1993 Bolivian Household Sur

personal characteristics and for every year of education. The hazard conditional on being unconstrained according to the Weibull distribution is:

$$\lambda = \frac{f(t)}{S(t)} = \lambda_i \alpha_1 t^{\alpha_1 - 1}$$

The hazard conditional on being unconstrained, on the other hand, is:

$$\phi = \frac{f(t)}{S(t)} = \phi_i \alpha_2 t^{\alpha_2 - 1}.$$

Using the estimated coefficients for λ_i, ϕ_i, α_1, and α_2 and evaluating them at the average available unearned income, the values of λ and ϕ for education levels $t = 0,1,\ldots,20$ for different types of individuals are calculated. These values are then plotted as shown in Figures 7–14.

Overall, constrained individuals have higher hazards of quitting school, compared to unconstrained individuals. As shown in Figure 7, this is more evident for indigenous than for nonindigenous women.[21] Alpha (α), the time dependence parameter, is greater than one, indicating that the probability of quitting school increases as t approaches 20 years of education. In other words, an individual is more likely to quit school between the nineteenth and twentieth year of schooling than between the second and third year. Graphically, this is shown by a positively sloped, convex hazard. Figure 8 indicates that single indigenous women have much higher hazards than men, with both a level and a slope difference.[22] This indicates that the hazard of quitting school for women increases at a much faster rate than for men as t approaches 20 years of education. As expected, the hazard of quitting school is higher for indigenous individuals and heads of household, holding everything else constant. Furthermore, individuals with greater unearned available income have a lower hazard of quitting school, holding all else constant. These results hold true for both the constrained and unconstrained samples no matter what definition of "constraint" is used.

When comparing indigenous married men and women (Figure 9), it is interesting to note that the difference between constrained and unconstrained hazards is much greater for men than for women. In particular, the hazard rate for constrained indigenous men who are heads of household is so high and increases at such a high rate that it overcomes the hazard rate of unconstrained indigenous women.

---

[21] The figure refers to calculated hazards for women; however similar results were found for men. These additional figures are available upon request.

[22] The figure refers to calculated hazards for indigenous individuals; however similar results were found for their nonindigenous counterparts. These additional figures are available upon request.

Figure 7: Hazard Rates for Single Women

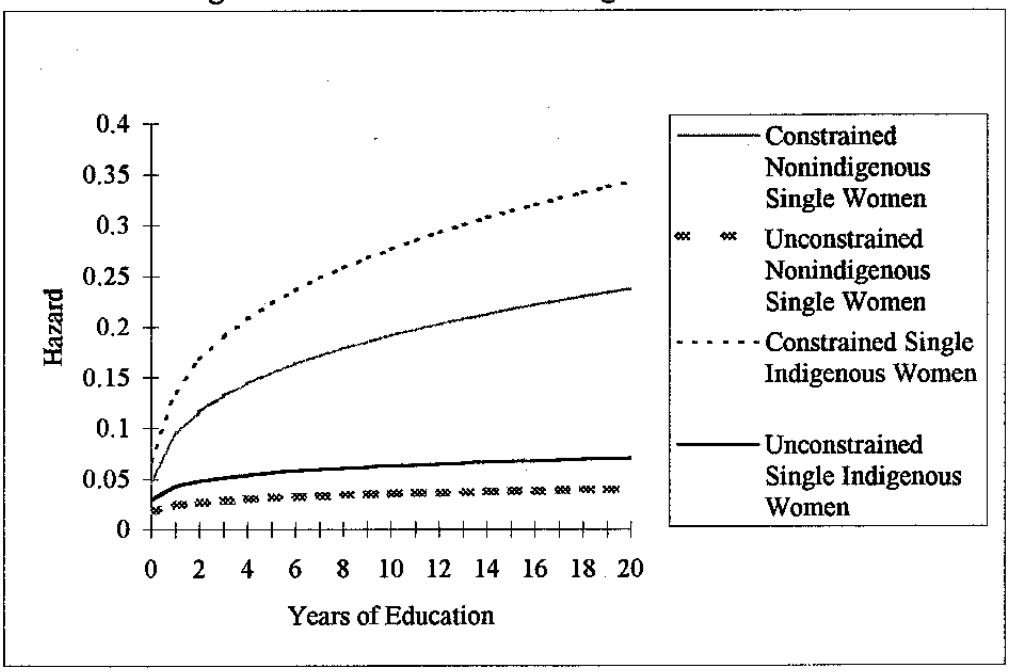


Figure 8: Hazard Rates for Nonindigenous Single Men and Women

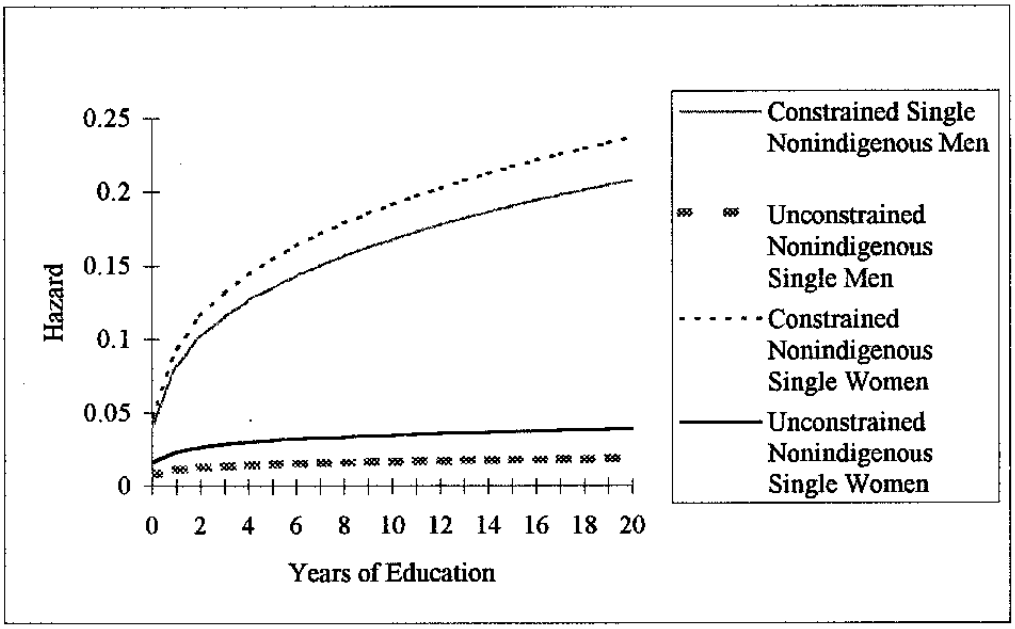


Figure 9: Hazard Rates for Indigenous Married Men and Women Who Are Heads of Household

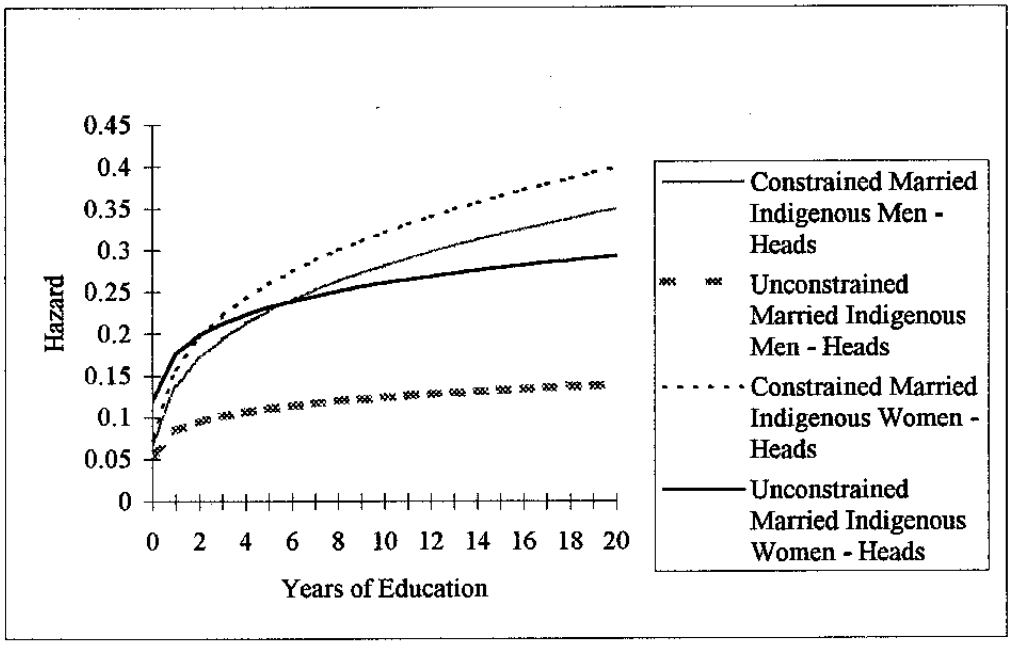


Figure 10: Hazard Rates for Nonindigenous Married & Single Women

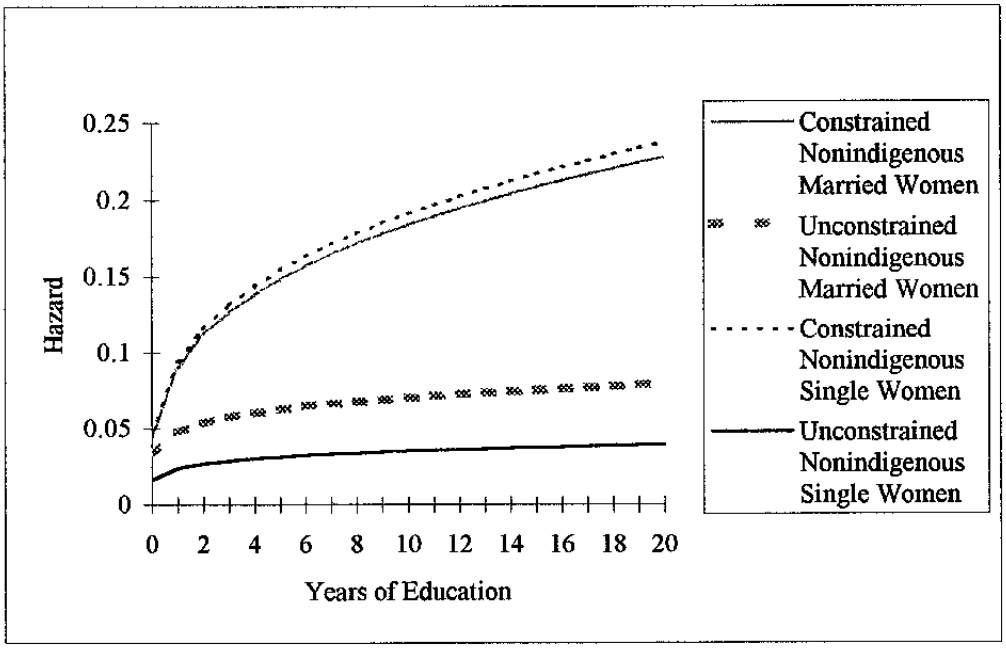


Figure 11: Simulation Results for Single Indigenous Women

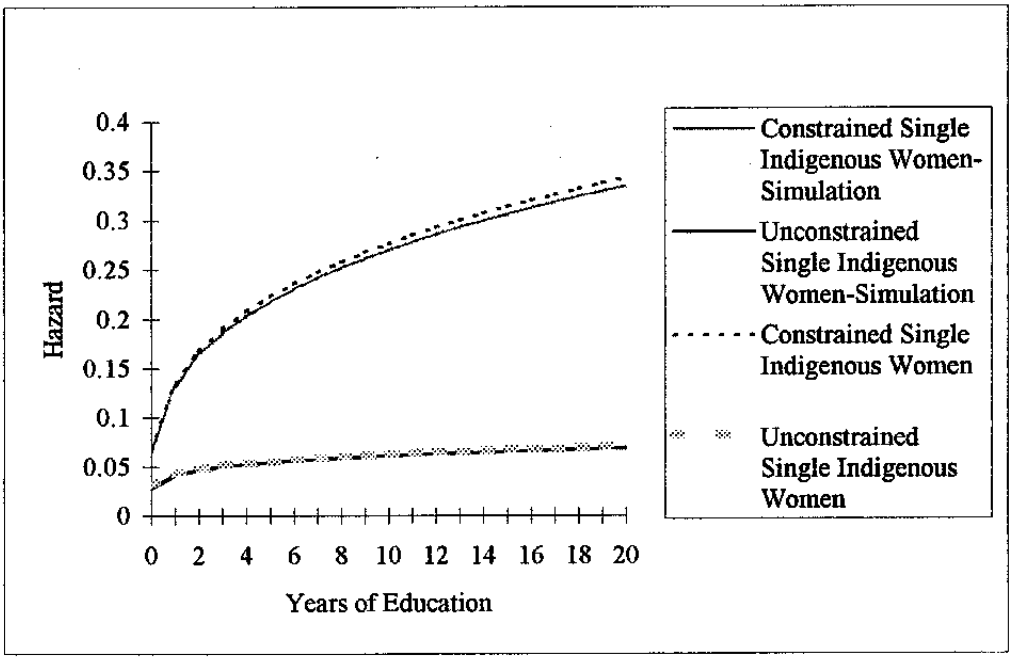


Figure 12: Simulation Results for Married Indigenous Women

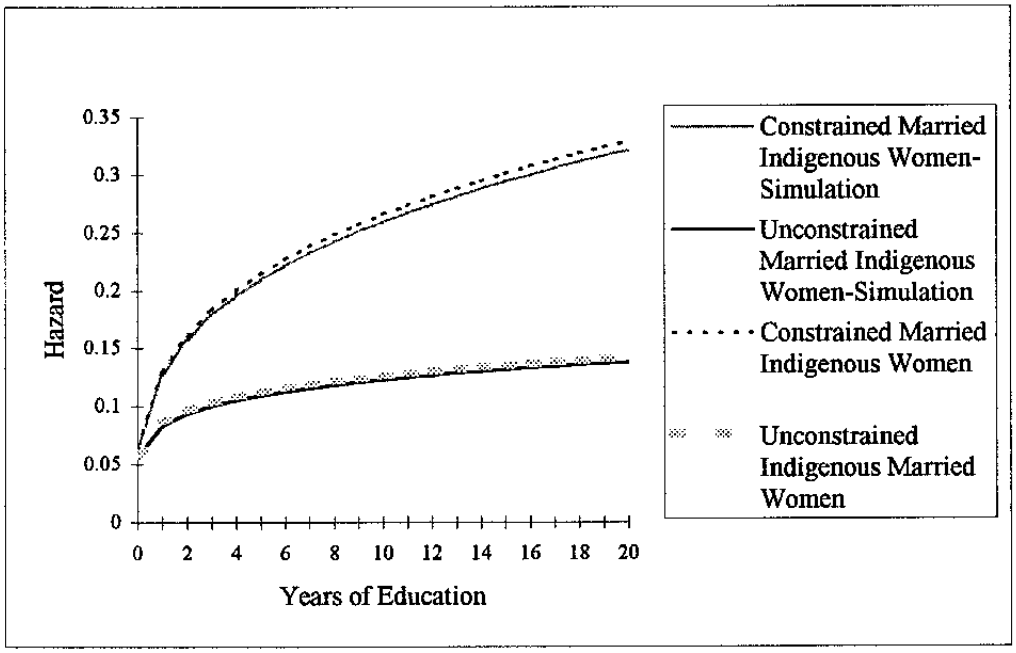


Figure 13: Simulation Results for Unconditional Hazards for Married Men

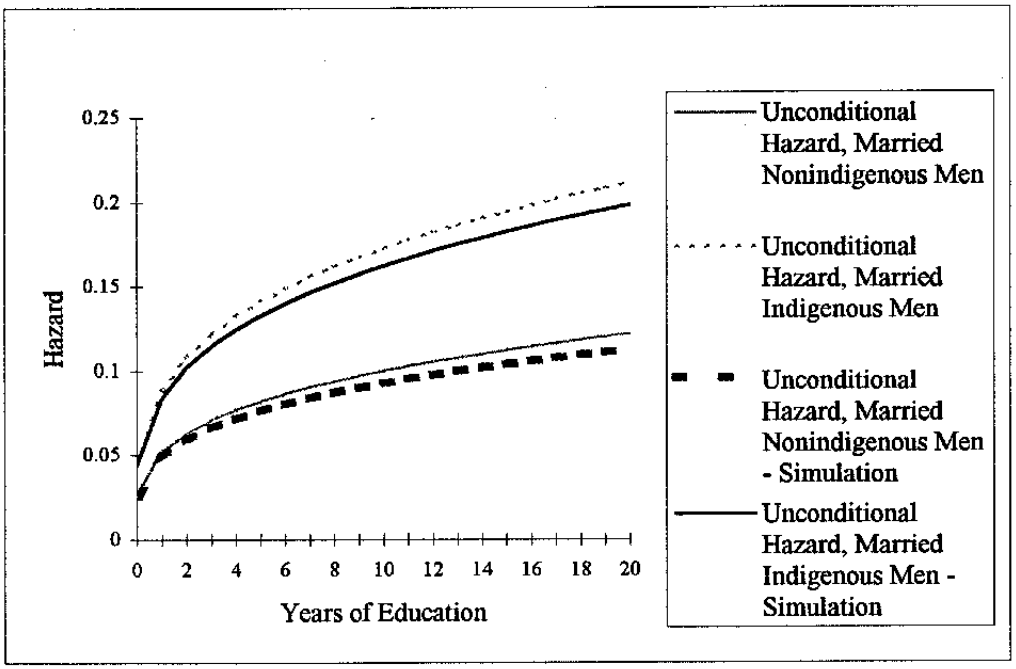
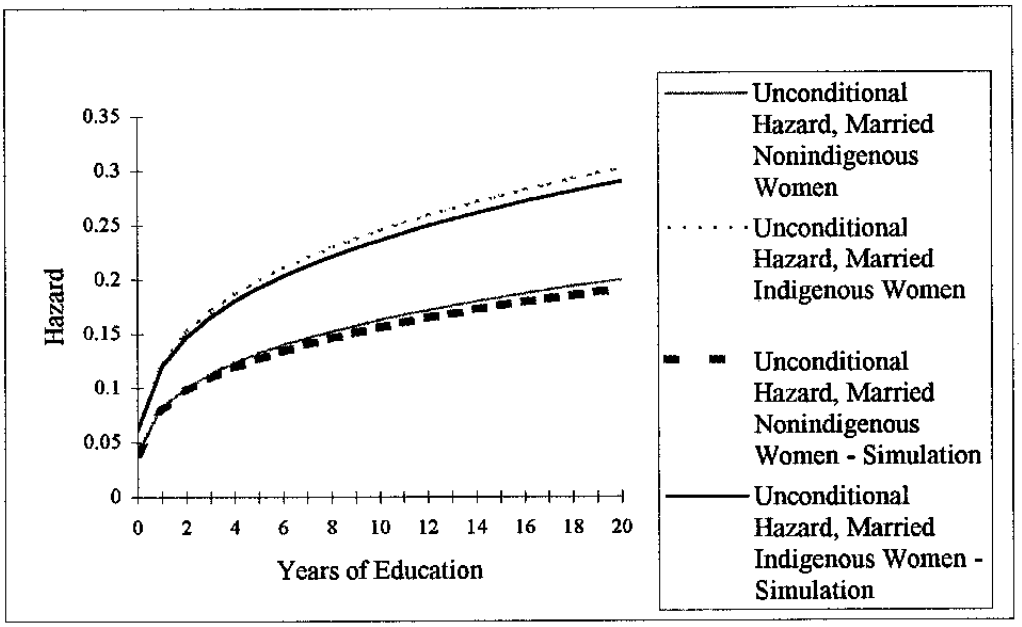


Figure 14: Simulation for Unconditional Hazards for Married Women



When comparing married to single individuals, note that the hazard of quitting school increases for married individuals conditional on being unconstrained, but decreases or is insignificant for constrained individuals. [23] One possible explanation is that married, constrained individuals have an advantage over single, constrained individuals in that they can depend on someone to take care of the children, help pay bills, or ameliorate the existing constraint. Therefore, married individuals become less likely to quit school conditional on the constraint. For unconstrained individuals, on the other hand, marriage itself may increase the hazard of leaving school. Figure 10 indicates that unconstrained single women have slightly lower hazards than unconstrained married women, and that this is reversed for constrained women. Furthermore, the difference between the constrained and unconstrained sample is greater among single women. [24] Finally, the coefficients on the hazard rates for individuals who have had to repeat a grade are mostly insignificant.

In general, the most striking difference is that the probability of quitting school for indigenous women is far greater than that for their male counterparts or for any other group of people. As shown in the previous figures, this difference is exacerbated if an indigenous woman is married or is a head of household.

C. Simulation Results

The estimated coefficients from Table 4 are needed to simulate an increase in available unearned income. This simulation is conducted to examine whether a cash transfer will make a difference in the educational attainment of different types of individuals. The fitted hazards are evaluated at the average unearned income, which is equivalent to Bs1,000 bolivianos. In order to estimate a 100 percent increase in unearned available income, the hazard is evaluated at Bs 2,000 bolivianos. Hazard rates are then recalculated for different types of individuals for t=1 to 20. As shown in Figures 11 and 12, the conditional results show that there is only a small reduction in the hazard of quitting school for women.[25] This may indicate that the high hazard rates found for indigenous women, for example, may be driven by childcare constraints, cultural prejudices, or other constraints, rather than by a monetary constraint.

Next, the unconstrained hazard is calculated in order to capture the effects of a cash transfer on both the probability of being constrained, as well as on the hazard itself. The same calculation is made for a 100 percent cash transfer. Specifically, the fitted values of the probabilities (shown in Table 5) are paired with the fitted conditional hazards:

---

[23] Depending on the definition used.

[24] The figure refers to calculated hazards for women; however similar results were found for men. These additional figures are available upon request.

[25] The figure refers to calculated hazards for women; however similar results were found for men. These additional figures are available upon request.

Unconditional Hazard = P(unconstrained)*[unconstrained hazard] +
P(constrained)*[constrained hazard].

Figures 13 and 14 present the results for married men and women.[26] In contrast to the conditional hazards, cash transfers have an important effect on the unconditional hazards. This is more pronounced for men than for women, constituting about an 8 percent reduction in the unconditional hazard rates for single men and a 6.3 percent reduction for single women. The smallest change in the hazard after the cash transfer is for married, indigenous women; it only changes about 5 percent. This implies that a cash transfer can reduce the probability of being constrained and therefore increase overall educational levels.

These are interesting results because they point to the fact that cash transfers will not be very effective in inducing an increase in educational achievement unless other nonmonetary constraints are removed. For example, indigenous women, who have the lowest educational levels, will require additional types of help. These may include in-kind transfers, such as childcare facilities, or educational campaigns for parents who refuse to put their daughters through school for traditional or cultural reasons. If, on the other hand, the probability of being constrained can be reduced, then a cash transfer may have positive results in improving educational levels.

VII. Summary and Conclusions

This paper has shown that the link between government spending and improvements on the educational levels of the population is not direct. The results show that a cash transfer by itself, although helpful, is not enough to make a large difference in the educational attainment of Bolivians if it is unable to reduce existing constraints. In particular, the probability that a person leaves school is higher for constrained individuals, particularly if they are female, indigenous, or heads of household. The most striking results are those for indigenous women, who have the highest hazards of leaving school and a greater probability of being constrained in their educational choice, indicating that this group is at a serious disadvantage when it comes to educational achievement.

The implication of these results are that policymakers should concentrate first on removing the existing constraints before expecting a significant improvement in educational achievement. The probability of being constrained falls with a cash transfer, although only slightly for married women, pointing to the fact that constraints could be caused by cultural or other restrictions, especially in the case of indigenous women. Further research should focus on the types of nonfinancial constraints people face. This will allow one to decide whether in-kind transfers, such as educational campaigns, awareness programs, or childcare facilities, will be more effective in increasing educational levels in Bolivia.

---

[26] Similar results were found for single men and women, and are available upon request.

The more general issue is whether people with low marginal benefits from additional years of schooling and those with high marginal costs can be distinguished. In this study, the constrained sample represents individuals with high marginal costs for additional schooling. The distinction between constrained and unconstrained is based on each individual's self-classification into either group. This type of study could benefit from similar panel data that could allow verification of whether the individual was in fact financially constrained at the time she left school. Bearing this in mind, the results point to the importance of nonmonetary marginal costs, and the difficulty in identifying these costs.

Appendix I. Sensitivity Analysis: Probability of Being Constrained

Definitions of Constraint

Why do you not attend school?

1) Because of work
2) I'm done with school
4) Lack of resources
5) Establishments are too far away
6) Because of age
7) Family problems
8) Other problems

Define:

con1=1 if reasons are: 1,4,5,6,7,8

con2=1 if reasons are: (1 and educ<9),4,5,6,7,8
constr=1 if reasons are: 1,4,5,7,8

cons=1 if reasons are: (1 and educ<9),4,5,7,8
con3=1 if reasons are: (1 and educ<9),4,5,6,7

con4=1 if reasons are: (1 and educ<9),4,5,6,8
con5=1 if reasons are: (1 and educ<9), 4,5

con6=1 if reasons are: 4

Appendix Table 6. Sensitivity Analysis: Probability of Being Constrained

	Con1	Cons	Constr	Con2	Con3
Constant	-1.0336 ***	-1.8183 ***	-1.3555 ***	-1.4423 ***	-2.0216 ***
	(0.1260)	(0.1207)	(0.1135)	(0.1223)	(0.1229)
Male	0.3424 **	-0.0824	0.7539 ***	-0.5705 ***	-0.1157
	(0.1612)	(0.1582)	(0.1454)	(0.1546)	(0.1608)
Head	2.4094 ***	0.7446 ***	0.8322 ***	2.1995 ***	0.8819 ***
	(0.1090)	(0.1028)	(0.0927)	(0.1001)	(0.1018)
Married	2.5746 ***	2.0479 ***	2.0931 ***	2.3105 ***	2.1048 ***
	(0.0603)	(0.0603)	(0.0557)	(0.0574)	(0.0609)
Indigenous	1.0397 ***	0.3026 ***	0.1237 **	1.1189 ***	0.2208 ***
	(0.0593)	(0.0563)	(0.0539)	(0.0564)	(0.0566)
Log (available unearned income)	-0.0641 ***	-0.1019 ***	-0.1053 ***	-0.0487 ***	-0.1025 ***
	(0.0173)	(0.0158)	(0.0155)	(0.0165)	(0.0165)
Adult to child ratio	-0.1212	0.6057 ***	0.4344 ***	0.0588	0.5824 ***
	(0.1216)	(0.1150)	(0.1173)	(0.1142)	(0.1157)
One child under 6	0.2270 ***	0.1876 **	0.2570 ***	0.1050	0.2238 ***
	(0.0844)	(0.0830)	(0.0795)	(0.0821)	(0.0841)
More than one child under 6	0.7676 ***	0.2411 *	0.3123 **	0.6104 ***	0.2644 **
	(0.1329)	(0.1344)	(0.1275)	(0.1290)	(0.1317)
One child between 6 and 13	-0.3222 ***	0.0255	-0.0058	-0.2770 ***	0.0227
	(0.0670)	(0.0656)	(0.0616)	(0.0650)	(0.0659)
More than one child between 6 and 13	-0.4354 ***	0.0708	-0.0748	-0.2747 ***	0.1216 *
	(0.0689)	(0.0658)	(0.0639)	(0.0669)	(0.0669)
Married*male	-1.0908 ***	-1.3153 ***	-0.5772 ***	-1.7970 ***	-1.2953 ***
	(0.1077)	(0.1223)	(0.1048)	(0.1035)	(0.1202)
Head*male	-1.4909 ***	-0.4087 ***	-0.7625 ***	-1.0007 ***	-0.4405 ***
	(0.1445)	(0.1531)	(0.1329)	(0.1363)	(0.1509)
Indigenous*male	-0.2170 **	0.2460 ***	0.1587 **	-0.2415 ***	0.3103 ***
	(0.0851)	(0.0837)	(0.0780)	(0.0797)	(0.0847)
Adult to child ratio*male	-0.3605 **	-0.4562 ***	-0.6719 ***	-0.1863	-0.5322 ***
	(0.1751)	(0.1755)	(0.1718)	(0.1634)	(0.1738)
One child under 6*male	0.1175	-0.0658	0.1205	-0.0477	-0.0002
	(0.1211)	(0.1242)	(0.1157)	(0.1169)	(0.1255)
More than one child under 6*male	0.2309	0.0753	0.3762 **	-0.0862	0.1870
	(0.1924)	(0.2035)	(0.1853)	(0.1861)	(0.1984)
One child between 6 and 13*male	0.0158	0.0434	-0.0717	0.1233	0.0790
	(0.0953)	(0.0973)	(0.0889)	(0.0920)	(0.0985)
More than one child between 6 and 13*male	0.0495	0.1575	0.0028	0.1756 *	0.1364
	(0.0990)	(0.0964)	(0.0927)	(0.0935)	(0.0985)
Log (available unearned income)*male	-0.0551 **	0.0096	-0.0828 ***	0.0586 ***	0.0099
	(0.0216)	(0.0197)	(0.0194)	(0.0198)	(0.0207)

Source: 1993 Bolivian Household Survey

Note: Standard Errors are shown in parenthesis. *, **, and *** indicate significance at the 10 percent, 5 percent, and 1 percent level of significance, respectively.

Appendix Table 6. Sensitivity Analysis: Probability of Being Constrained (concluded)

	Cons	Con4	Con5	Con6	Domestic Workers
Constant	-1.8183 ***	-2.0608 ***	-2.3301 ***	-2.7855 ***	-1.7803 ***
	(0.1207)	(0.1420)	(0.1567)	(0.2199)	(0.1161)
Male	-0.0824	-0.1518	-0.1833	-0.1598	-0.1130
	(0.1582)	(0.1770)	(0.1924)	(0.2800)	(0.1530)
Head	0.7446 ***	0.3902 ***	0.5545 ***	-0.2667	0.4638 ***
	(0.1028)	(0.1214)	(0.1310)	(0.2014)	(0.0967)
Married	2.0479 ***	0.7202 ***	0.7210 ***	0.3126 ***	1.7103 ***
	(0.0603)	(0.0738)	(0.0824)	(0.1092)	(0.0535)
Indigenous	0.3026 ***	0.7772 ***	0.7917 ***	0.7000 ***	0.5090 ***
	(0.0563)	(0.0696)	(0.0772)	(0.1064)	(0.0519)
Log (available unearned income)	-0.1019 ***	-0.1334 ***	-0.1506 ***	-0.1311 ***	-0.0609 ***
	(0.0158)	(0.0193)	(0.0210)	(0.0312)	(0.0153)
Adult to child ratio	0.6057 ***	0.1978	0.1630	0.4146 **	0.5323 ***
	(0.1150)	(0.1458)	(0.1592)	(0.2025)	(0.1115)
One child under 6	0.1876 **	0.0597	0.1090	0.0702	0.2192 ***
	(0.0830)	(0.1056)	(0.1183)	(0.1587)	(0.0777)
More than one child under 6	0.2411 *	0.0889	0.1251	0.0325	0.2549 **
	(0.1344)	(0.1741)	(0.1920)	(0.2545)	(0.1252)
One child between 6 and 13	0.0255	0.0778	0.0843	-0.0677	-0.0220
	(0.0656)	(0.0817)	(0.0922)	(0.1259)	(0.0608)
More than one child between 6 and 13	0.0708	0.1484 *	0.2575 ***	-0.0159	-0.0619
	(0.0658)	(0.0805)	(0.0889)	(0.1213)	(0.0627)
Married*male	-1.3153 ***	-0.0373	0.0540	-0.0400	-0.9820 ***
	(0.1223)	(0.1318)	(0.1401)	(0.2232)	(0.1145)
Head*male	-0.4087 ***	0.1158	0.0954	0.4624	-0.1314
	(0.1531)	(0.1677)	(0.1782)	(0.2896)	(0.1448)
Indigenous*male	0.2460 ***	-0.1826 *	-0.2107 **	-0.3490 **	0.0425
	(0.0837)	(0.0942)	(0.1015)	(0.1512)	(0.0802)
Adult to child ratio*male	-0.4562 ***	0.0723	0.0024	-0.1734	-0.3895 **
	(0.1755)	(0.1988)	(0.2119)	(0.2965)	(0.1686)
One child under 6*male	-0.0658	-0.0012	0.0631	-0.0661	-0.0935
	(0.1242)	(0.1437)	(0.1552)	(0.2249)	(0.1194)
More than one child under 6*male	0.0753	0.0997	0.2131	0.0091	0.0698
	(0.2035)	(0.2346)	(0.2511)	(0.3656)	(0.1916)
One child beetween 6 and 13*male	0.0434	0.0359	0.0688	0.0053	0.0861
	(0.0973)	(0.1113)	(0.1208)	(0.1796)	(0.0937)
More than one child child between 6 and 13*male	0.1575	0.0816	0.0061	-0.0351	0.2825 ***
	(0.0964)	(0.1098)	(0.1177)	(0.1763)	(0.0942)
Log (available unearned income)*male	0.0096	0.0402 *	0.0568 **	0.0328	-0.0309
	(0.0197)	(0.0230)	(0.0247)	(0.0381)	(0.0195)

Source: 1993 Bolivian Household Survey.

Note: Standard Errors are shown in parenthesis. *, **, and *** indicate significance at the 10 percent, 5 percent, and 1 percent level of significance, respectively.

References

Amemiya, Takeshi, 1985, *Advanced Econometrics* (Cambridge: Harvard University Press).

Becker, G., 1967, *Human Capital and the Personal Distribution of Income,* otherwise known as the Woytinsky Lecture (Ann Arbor: University of Michigan Press).

Card, D., 1994, "Earnings, Schooling, and Ability Revisited," NBER Working Paper, No. 4832 (Cambridge, Massachusetts: National Bureau of Economic Research).

Chishti, S., and A. Lodhi, 1988, "Simultaneous Determination of Choice to Attend School and the Demand for School Education: A Case Study of Karachi, Pakistan," *Pakistan Journal of Applied Economics,* Vol. 7, No. 2, pp. 101–108.

Greene, William H., 1993, *Econometric Analysis* (New York: Macmillan Publishing Company, 2nd ed.).

Harbison, Ralph W., and Eric A. Hanushek, 1992, *Educational Performance of the Poor: Lessons from Rural Northeast Brazil* (New York: Oxford University Press).

Jensen, P., and H. Skyt Nielsen, 1996, "Child Labour or School Attendance? Evidence from Zambia," Centre for Labour Market and Social Research, University of Aarhus Working Paper 96–14.

Maddala, G.S., 1983, "Limited-Dependent and Qualitative Variables in Econometrics," Econometric Society Monographs No. 3 (Cambridge: Cambridge University Press).

Mergos, George J., 1992, "The Economic Contribution of Children in Peasant Agriculture and the Effect of Education: Evidence from the Philippines" *The Pakistan Development Review,* Vol. 31, No. 2, pp. 189–201.

Patiño, Elizabeth, 1996, Statistics given in a radio interview, Cochabamba, Bolivia, October 25 (Erbol News Service).

Psacharopoulos, G., 1993, "Ethnicity, Education, and Earnings in Bolivia and Guatemala," *Comparative Educational Review,* Vol. 37, No. 1, pp. 9–20.

Rosenzweig, M., and R. Evenson, 1977, "Fertility, Schooling and the Economic Contribution of Children in Rural India : An Econometric Analysis," *Econometrica,* Vol. 45, No.5, pp. 1065–1079.

World Bank, 1996, "Bolivia: Poverty, Equity and Income, Selected Policies for Expanding Earning Opportunities for the Poor," Background Papers, Report No. 15272–BO, Vol. II.