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Evidence from Bolivia**

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# The Influence of Microfinance on Human Capital Formation: Evidence from Bolivia

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## I. Introduction

This paper addresses issues related to rural poverty, human capital formation, and microfinance. Indeed, the alleviation of rural poverty will continue to be one of the most difficult challenges for the developing world in the new century. Among several policy tools for reducing poverty, there is a growing consensus that, in the long run, human capital formation —through primary and secondary education— will be one of the most powerful instruments (Schultz, 1961; Bils and Klenow, 2000; Krueger and Lindahl, 2000). Formal educational achievements are limited, however, particularly in the rural areas of low-income countries (Barro and Jong-Wha, 2001). Among several reasons, low schooling achievements reflect lack of the required infrastructure and resources (*e.g.*, roads, schools, teachers and materials). Low achievements also reflect a competing demand for the youth's labor contributions, either to fulfill the household's basic income generating requirements or take care of younger siblings, in order to facilitate the labor efforts of more productive household members. Differential outcomes may even be due to cultural barriers (*e.g.*, expectations about gender roles).

The performance of financial markets and human capital formation are related in several ways. Access to financial services allows rural households to more fully take advantage of their productive opportunities, facilitates consumption smoothing, and offers tools for the management of risk —thereby reducing the vulnerability associated with poverty. Higher and more stable income flows positively influence the demand for education in the rural areas of low-income countries. Information, incentive, and contract enforcement problems severely constrain, however, the access of poor rural households to formal financial markets. Through the adoption of new lending technologies, nevertheless, microfinance organizations (MFOs) have been offering mostly credit and sometimes deposit facilities for savings to segments of the population otherwise without access to formal financial services (Navajas and González-Vega, 2002). Through its impact on the demand for schooling, improved access to financial services should enhance human capital formation in the rural areas.

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In effect, microfinance may influence human capital formation through several channels. First, income levels influence schooling achievements (Behrman and Knowles, 1999). To the extent to which microfinance may influence the growth and stability of rural household incomes, it may influence schooling choices (*income effects*). Given the high opportunity costs of keeping children in school and the unexploited market opportunities available to credit-constrained rural households, its potential impact on income flows may be one of the most powerful influences of microfinance on human capital formation.

Second, several researchers have hypothesized that women have a stronger preference for educating their children than men (Thomas, 1990; Sallee, 2001; Behrman and Rosenzweig, 2002). If preferences toward education are gender-related and if microfinance programs improve access to loans by women and thereby change their power to influence household schooling decisions, the rate of human capital formation may be altered (*gender effects*). This approach substitutes a bargaining process within the household for the more traditional unitary model of the optimization of a single preference set. The outcome of this bargaining process reflects both different preference functions and different relative power in influencing decisions (Phipps and Burton, 1995; McElroy, 1997). Changes in female status, through the influence of microfinance programs, may redirect household resource allocations to human capital formation (Nanda, 1999).

Third, there is a growing literature on the influence of the demand for child labor on schooling outcomes (Psacharopoulos, 1996; Jensen y Nielsen, 1997; Patrinos y Psacharopoulos, 1997; Grootaert y Patrinos, 1999; and Trigueros, 2002, among others). Household productive activities made possible by access to the services of MFOs may change the demand for child labor either directly, in the newly-created or expanded microenterprises, or indirectly, in child care (*labor demand effects*).

Fourth, given uncertainty, imperfect information, and high private discount rates, household choices about education may be revised with the acquisition of new knowledge, which modifies intertemporal preferences or changes perceptions about the value of schooling (*education effect*). In effect, higher levels of parental education have been found to positively influence schooling decisions (Lillard y Willis, 1994). In particular, preferences about children's schooling may be influenced by adult training programs that highlight the importance of human capital, both as a tool for income generation and as a determinant of the quality of life.

In effect, organizations that work close to the poor may significantly influence the information set of rural households as well as their preferences over decisions that affect the lives and well being of their members. Microfinance organizations, for instance, frequently hold meetings with their borrowers on a regular basis, to collect payments and to inform clients about new loan policies or regulations. Some MFOs take advantage of these meetings to train borrowers about other issues, such as birth control, child education, health care, and nutrition (*credit with education programs*).

The influence of these practices in improving standards of living is subject to great debate and it is not discussed here. An additional and important debate questions the optimality, from an organizational perspective, of *jointly* providing credit and other services. On the one hand, there may be economies of scope from this joint provision. On the other hand, the supply of non-financial services may jeopardize the pursuit of financial sustainability by the MFO, through diseconomies from overburdening the organization's management capabilities or from signals that weaken borrower discipline (Gonzalez-Vega, 2001). This paper does not address these issues. The analysis of the paper is, in this respect, incomplete, in that it only assesses the marginal *value* of the supply of credit with education services, but it does not measure the marginal *cost* of providing these services.<sup>1</sup> The paper is also incomplete in that it ignores divergences between the private and social costs and benefits of the supply of these services as well as other potential impacts on human capital formation achieved, for instance, through changes in health-related choices, as examined in MkNelly and Dunford (1999), Nanda (1999), and Romero (2002). Moreover, health and nutrition improvements may, in turn, influence educational achievements.

This paper evaluates the influence of microfinance programs on human capital formation by specifically looking at whether children from households with access to *credit-cum-education* programs are kept longer in school, compared to children from households that simply receive loans from MFOs that do not offer non-financial services to their borrowers and compared to children from households without loans from MFOs. Data from a 2001 survey of microfinance borrowers in the region of Batallas, Bolivia, are used to test the hypotheses. The information comes from detailed interviews with 130 households, made up of 764 persons, where some household members had been clients of one of two microfinance organizations operating in the region —FFH/CRECER and SARTAWI— for different lengths of time (Romero, 2002). The analysis examines schooling decisions, as a proxy for human capital formation, in response to both economic and cultural influences.

A brief review of some related literature and a description of relevant features about Bolivia and Batallas follow. Next, the methods used to test hypotheses about links between microfinance and human capital formation are explained. After the presentation of key results, conclusions and recommendations are summarized.

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<sup>1</sup> The paper does not evaluate the amount of the subsidies that have been needed for these purposes. Moreover, at least one of the MFOs considered in the paper (SARTAWI) has recently encountered severe financial difficulties.

## **II. Education, microfinance, and income**

The relationships between education and income are complex. If a high marginal value is placed on the health and education of family members, increases in income will be devoted to improvements in these areas. Thus, income is expected to positively influence the schooling decisions of poor households. At the same time, healthier and better-educated household members will be able to produce more, and this improved productivity will be rewarded in the labor market with higher incomes (Duryea and Pagés, 2002). The commitment of current resources to improving a member's health and education, therefore, will increase that person's future productivity, income, and potential contribution to the household's welfare.

Human capital formation faces, however, severe obstacles. Because human capital cannot be seized and transferred to a lender in the event of default, it cannot be used as collateral; consequently, the poor must fund their educational choices out of their retained earnings, wealth, or abstention from current productive work. Because they are poor, the marginal cost of doing so may be prohibitively high (Ray, 1998).

This shortcoming of credit markets accentuates the joint causation between income and human capital. Combined with increasing returns to investment in education, imperfect credit markets may generate a poverty trap (Bardhan and Udry, 1999). That is, relatively wealthy individuals will be able to invest in human capital, and this will enable them to earn enough income to remain wealthy. In contrast, the poor will be unable to invest in human capital, and thus they will earn lower incomes and remain poor. By increasing the flow of household earnings, microfinance may allow greater investments in human capital. Furthermore, through the fungibility of borrowed funds, loan funds may finance current educational expenses.

Indeed, the innovations in lending technologies associated with microfinance usually allow households without traditional collateral to pledge their reputation and, therefore, their future ability to generate income flows from their human capital, as a guarantee on their loans. In this way, microfinance enhances the deployable wealth of the household. Loans from microfinance organizations increase the pool of current resources available, among other uses, for education, and may increase future income flows, thereby providing additional resources to fund education.

Moreover, vulnerability to risk also reduces the demand for schooling. Under income volatility, poor households may react in various ways. The absence of some usual remedies for risk, borrowing and insurance, results in limited and costly income smoothing strategies (Deaton, 1997). They adopt diversified production plans or employment strategies to reduce their exposure to the risk of adverse income shocks, even if this entails lower average incomes (Murdock, 1995). In addition to such efforts to smooth income, households smooth consumption by saving, selling assets, migrating, withdrawing children from school, and developing informal insurance and credit arrangements (Kanbur and Squire, 2001).

Access to loans from MFOs —particularly when emergency loans are offered, such as those from the internal account of village banks— reduce the probability that children will be withdrawn from school in the presence of adverse income shocks. Indeed, Jacoby and Skoufias (1997), among others, show that poor households affected by a decline in income withdraw their children from school. According to these authors, a 10 percent decline in agricultural income across seasons leads to a fall in school attendance of about five days in a sample of six Indian villages.

Based on Schultz (1993), Lardé de Palomo and Argüello de Morera (2000) recognize that the late incorporation of children to the schooling system and their early withdrawal are mostly due to demand factors. When parents decide about their children's schooling, they decide to allocate a fraction of household income to education, according to their perceived profitability of schooling. This perception depends, in turn, on the parents' own level of education and on features of the economic environment. Microfinance-cum-education programs may influence these perceptions. Behrman, Pollack, and Taubman (1986) further argue that resources for education are split according to the number of children, their gender and their ages, given household composition and the severity of the budget constraint.

In rural areas, the demand for schooling is influenced by determinants of other forms of human capital that may substitute for or complement education and that are influenced by microfinance-cum-education programs (such as health and nutrition), by available sources of non-labor income, such as remittances, and —to incorporate market imperfections— by assets that can be used as collateral for loans. Khandker (1998) found that microloans in Bangladesh had a significant impact on children's schooling, especially for boys. Gender considerations may also matter. Ray (1998) notes that, for all low-income countries in 1995, there were almost twice as many female as there were male illiterates.

### III. Measurement of impact

This paper is related to the literature on microfinance that distinguishes between minimalist and integrated MFOs.<sup>2</sup> Kanbur and Squire (2001) define *minimalist* credit as a program where only loans are provided, while *integrated* credit refers to the practice of supplementing loans with a package of extension services, training, and/or market support.

Some critics of minimalist approaches argue that these programs do not empower female participants and that, as a result, opportunities for greater welfare impacts are missed. Hashemi, Schuler, and Riley (1996) argue that, while strategies such as non-formal education, social and political consciousness-raising, or political organizing are needed to confront power structures, programs organized around credit cannot achieve this goal. These authors agree, however, that minimalist credit programs do in fact empower women, mostly by strengthening their economic roles, increasing their abilities to contribute to the household's support, and through mechanisms associated with changes in their economic status. In any case, therefore, the influence of microfinance programs is mediated by changes in women's empowerment, although through different channels. Supporters of minimalist programs emphasize income effects. Supporters of integrated programs emphasize gender and education effects.

Moreover, several authors, particularly those associated with The Ohio State University's Rural Finance Program, argue that financial services are not good tools to achieve non-financial objectives and that, when such objectives are pursued, the sustainability of the supply of financial services is jeopardized. These authors recommend that MFOs should be simply asked to offer efficient financial services to the target population (González-Vega, 1998). In performing these typical functions, however, financial services still influence the demand for schooling.

Furthermore, Meyer (2002) reminds us that measurement of the impact of microfinance on clients is the most difficult and controversial aspect in the evaluation of the performance of MFOs. This assessment of impact, which involves attributing specific effects to specific interventions, encounters formidable methodological problems (Ravallion, 2001). One important dimension of these difficulties, of relevance here, is the possibility of selection bias.

Both the selection of clients and program placement are sources of concern. The first concern arises because MFO clients will not likely be randomly selected; rather, they possess characteristics that are systematically different from those of a randomly selected sample. Self-selection into the program can occur because of systematic differences in preferences among those who choose to participate and those who do not.

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<sup>2</sup> As indicated above, the paper does not address the implications of minimalist or integrated programs on the *sustainability* of MFOs. This is, however, a central question that must be included in any comprehensive evaluation of microfinance strategies.

Moreover, if the lender uses a systematic screening criterion, borrowers should differ from non-borrowers. Non-participants, therefore, are a non-equivalent comparison group. Ignoring this source of potential endogeneity can lead to biases due to the omission of unobserved relevant variables (Moffitt, 1991).

A second concern arises because MFOs choose to start operations in areas with specific attributes, such as communication and transportation facilities (Pitt and Khandker, 1998). Alternatively, programs may be developed in localities that are either more dynamic than others or where the incidence of poverty is greater, depending on the program's mission. Unmeasured locality factors and household attributes may simultaneously affect the demand for program participation, women's empowerment, and the demand for education. This possibility of selection bias implies the difficulty to determine if differences between groups are due to the supply of microfinance services or to non-representative clients and locations.

Our study attempted to minimize these selection problems. First, location selection biases are smaller here than when the evaluation covers broad geographic areas, because all the households interviewed live in the same municipality (Batallas) and are engaged in similar occupations. The lack of significance found in the regressions for the variables about distance supports our limited concern for a bias. Second, client selection issues were addressed by using a cohort approach in the sampling process. Program participants were separated into *old* clients, with at least two years in the program, for whom benefits had already accrued, and *new* clients, with less than one year in the program, who had successfully passed the credit screening mechanism but for whom benefits would not have yet accrued. Self-selection may still be present if older participants actually possess some unobserved features —such as social connections— that differ in degree from those of more recent participants. The results reported here establish impacts for households that have chosen to borrow, as non-participants were not observed.

#### **IV. Batallas, Bolivia**

Bolivia is one of the poorest countries in Latin America. According to the Human Development Index, calculated for 162 countries, Bolivia was ranked in the 104<sup>th</sup> place, only above Nicaragua, Honduras, Guatemala, and Haiti in the Western Hemisphere (UNDP, 2001). As elsewhere in Latin America, deep inequalities and poor quality characterize Bolivia's educational achievements. According to the UNDP (2001), gross school enrollment rates were 70 percent and life expectancy at birth was 62 years. The average number of schooling years completed had declined from 4.2 in 1960 to 4.0 in 1980 and then increased to 5.5 in 2000 (Barro and Jong-Wha, 2002). Productivity and wages are very low for a large share of working population. Over 45 percent of urban male workers earn less than US\$1 (PPP) a day (Duryea and Pagés, 2002).

The municipality of Batallas, department of La Paz, recognized as one of the poorest in the country, was among municipalities with a very low human development index (UDAPSO, 2001). Female illiteracy and fertility rates are very high. The population, mostly of the Aymara culture, is organized around rural unions (Morales, 2000). The main economic activity is agriculture.

In turn, over the past 15 years, Bolivia has experienced a strong development of microfinance activities (González-Vega and Rodríguez-Meza, 2002). Microfinance programs, originally developed as an employment-generation tool for excluded sectors of society, have grown into a competitive and sustainable segment of the Bolivian financial system. Outreach toward the rural areas is, however, still limited. For this study, two MFOs that offer services in the rural areas of Batallas are analyzed. One of them offers only credit, with a minimalist approach —SARTAWI— and the other one, FFH/CRECER —created under the sponsorship of Freedom from Hunger, offers training and non-formal education to borrowers, in an integrated credit-cum-education approach.

SARTAWI began its operations in the Batallas municipality in 1990. It was one of the first microfinance programs to develop a lending technology to reach poor households in the rural areas of the country. Loans are granted to individual borrowers under a community liability scheme. Since 1994, FFH/CRECER has been devoted to combat the effects of poverty and chronic hunger in the rural areas of Bolivia. It uses the credit with education approach, combining the model of village banks with a program of non-formal education for adults, on the topics of health, nutrition, family planning, handling of the village bank, and business tools. Rural women have been the main focus of this program. The design of the program's educational activities attempts to change attitudes and behaviors (*e.g.*, the value of a children's education, the implications of childbirth spacing) or to increase the self-confidence and skills of women (MkNelly and Dunford, 1999; Romero, 2002).

## V. An empirical model of education choices

Several authors have modeled schooling as an investment decision (Becker, 1993; Glick and Sahn, 2000). Similarly, we model decisions about keeping children in school as depending on the (discounted) net present value of education (benefits minus costs), as privately evaluated by household decision-makers. This NPV is a function of environmental and idiosyncratic factors, related to each household and to each child, in each locality. Thus, for each child in any household, this relationship can be expressed as:

$$(1) \quad NPV_i = f(I_i, H_i, F_i, N_i, E_i)$$

where  $NPV_i$  is the net present value of benefits and costs of attending school for the  $i$ th girl or boy;

$I_i$  refers to individual characteristics of the  $i$ th child, such as age and gender;

$H_i$  refers to characteristics, for the  $i$ th child, of her or his household;

$F_i$  refers to access by the household of the  $i$ th child to the credit services offered by the MFO, with or without education;

$N_i$  refers to the environment surrounding the  $i$ th child. This may be thought of as the supply side of the education market (*e.g.*, presence of schools); and

$E_i$  refers to empowerment variables, related to the importance of women in the decision-making process of the household of the  $i$ th child.

When the  $NPV$  is greater than zero, the child will attend school; otherwise, she/he will not. In practice, this latent variable cannot be measured. In its place, proxies for the potential determinants of the  $NPV$  of schooling are used here. An observed schooling achievement (dependent variable) can then be related to the proxy variables that represent the decision-making process (explanatory variables).

The realized status of a child regarding her/his schooling is considered the outcome of choices based on these determinants. If the child currently studies, it can be assumed that the  $NPV$  is positive. If the girl/boy shows gaps in her/his education, the implication is that the  $NPV$  turned out to be negative at some point and that the corresponding decision was to keep her/him away from school for one or more academic periods.

The dependent variable used for the empirical estimation of the model is the **education gap**, measured as the number of years of the difference between the highest level of education actually completed and the expected level of education, according to the child's age. The expected level of education is calculated as:

$$(2) \quad \text{Expected education} = \begin{cases} 0 & \text{if } age \leq 6 \\ (age - 6) & \text{if } 7 \leq age \leq 18 \\ 12 & \text{if } age > 18 \end{cases}$$

The education gap is then defined as:

$$(3) \quad \textit{Education gap} = \max \{0, \textit{expected education} - \textit{actual education}\}$$

If the child successfully stayed at school up to the end of secondary education, the gap is zero. If she/he encountered problems (such as late entry, failed grades, or desertion), the gap is a positive number. If she/he never attended school, her/his gap is the level of expected education according to age. In the regression analysis that follows, only girls and boys between 6 and 18 years old are considered.

Because the dependent variable is given by positive integer numbers, rather than as ordinary least squares, the estimation is specified as a count model. To take into account the possibility of over-dispersion, all the regressions are adjusted through a negative binomial model. This is, therefore, a Poisson maximum likelihood regression with over-dispersion. For this model, the magnitude of the coefficients for the parameters cannot be interpreted directly. The analysis here relies on the signs of the coefficients and on their magnitude in comparison to those for the same variable in other regressions as well as on the significance of the parameters. Some authors interpret the coefficients as semi-elasticities.

The explanatory variables have been grouped according to the classes defined in equation (1) as follows:

**Individual characteristics:**

- **Age:** measures the child's age in years. The expected sign is positive; the older the child, the more likely that she/he will show an education gap. This is a control variable.
- **Gender:** this is an instrumental (dummy) variable that takes the value of zero if the child is a boy, and the value of one if the child is a girl. The expected sign is positive, under the hypothesis that, within the Aymara culture, the value of the girls' education is less than the value of the boys' education; girls should show a larger education gap.
- **Direct son/daughter.** This is a dummy variable that takes into account if the child is a direct daughter or son of the borrower (in which case the value is one) or is the child of another member of the household (with value of zero). The expected sign is negative; if the child is a direct child of the borrower, the hypothesis is that she/he should show a smaller gap.

### **Household characteristics:**

- ***Position.*** This variable assigns the value of one to the oldest child in the household, two to the next, and so on. When there are granddaughters/grandsons in the household, the value of one is again assigned to the oldest child, two to the second one, and so on. A positive relationship between this variable and the gap is expected, under the assumption that the oldest children are more likely to be kept in school than the younger ones.
- ***Toddlers.*** This variable measures the number of children six years old or younger in the household. This variable is accounted for in two ways. As a dummy variable, it takes the value of one if one or more toddlers are present and the value of zero if none are present. As a continuous variable, it measures the number of toddlers in the household. The expected sign is positive, under the hypothesis that the presence of toddlers reduces the opportunities for schooling for older siblings, who must take care of the younger ones while their parents work. This influence is expected to be stronger in the case of youths 12 years old and older. Paradoxically, this situation may be more likely when the mother has a microenterprise that demands her attention.
- ***Human capital.*** This variable is measured as the number of years of schooling accumulated by the workers of the household divided by the number of workers. The expected sign is negative, under the hypothesis that if the workers (who usually make decisions about the children's education) have higher levels of education, they will have a stronger preference for schooling and the gap will be smaller. Also, the level of the workers' human capital is an indicator of their income-generating capacity and, therefore, of their ability to pay for education expenses.
- ***Own arable lands.*** This variable shows the size of the plots of land owned by the household and used for crops or other productive activities, measured in hectares. The sign will be positive if, when the household owns land, it is likely that it will demand the child's labor time for farming activities, in competition with school time. The sign may be negative, however, if the variable influences education through the level of the household's wealth and consumption-smoothing tools (Trigueros, 2002).
- ***Poverty Index.*** This variable is based on the poverty index used in Navajas *et al.* (2000), adopted from the 1992 *Mapa de Pobreza* for Bolivia. For each household, the index of minimum satisfaction of basic needs (health, access to public services, such as water and electricity, housing materials and overcrowding, and literacy and education) was used here with a special adjustment; the education component of the original index was dropped, in order to avoid endogeneity problems in the estimation.

The expected sign is negative; the higher the index of basic needs satisfaction, the less poor the household is estimated to be, and the smaller the expected education gap will be. The assumption is that greater poverty increases the opportunity cost of keeping children at school and that it also reduces the prospective yields of education.

**Environmental characteristics:**

- ***Distance to school.*** This variable considers the distance from the child's residence to the nearest educational center, measured as the time (in minutes) to arrive. For children between 6 and 12 years old, the variable used is the distance to the nearest elementary school, while for children between 13 and 18 years old, the variable used is the distance to the nearest high school. The expected sign is positive; greater distances should increase the gap.

**Financial characteristics:**

- ***Type of borrower.*** The sample has been divided into four groups of clients:
  - (1) SARTAWI's female borrowers,
  - (2) SARTAWI's wives/partners of male borrowers,
  - (3) old CRECER borrowers, and
  - (4) new CRECER borrowers.

This division allows different regressions, in order to compare the outcomes for the households of clients according to several criteria:

- ***CRECER clients versus SARTAWI clients.*** This classification tests for the difference between integrated and minimalist credit programs. In the first group are included the households of those clients who received loans from CRECER (old and new); in the second group are included the households of SARTAWI clients (direct female borrowers and wives of male borrowers).
- ***Access to credit with education.*** A regression according to this classification evaluates the impact of training on the education gap, considering only old clients, in order to control for access to credit and to allow potential influences to have time to occur. Any observed differences should be explained in terms of access to the training component of the CRECER program. The two groups here are old CRECER clients and SARTAWI clients, given that both consist of old borrowers.

- ***Access to credit.*** The group made up of new CRECER clients can be assumed not to have yet received any benefits from credit. We can then compare them against old CRECER and SARTAWI clients, to test for the influence of access to credit.
- ***Old and new CRECER clients.*** This test is intended to check for differences between old and new CRECER clients, then only these two groups are considered in order to control for possible unobserved features. Old CRECER clients are expected to show the influence of the credit with education program.
- ***Gender of SARTAWI clients.*** This test is performed to evaluate the difference of the influence on education gaps between direct female clients and the wives/partners of male clients. The assumption is that receiving a loan in her own name further empowers a woman client.

**Empowerment characteristics:**

- ***Proportion of the human capital held by women.*** This variable measures the proportion of the accumulated human capital —measured by the number of years of schooling— held by the women who work in each household with respect to the total stock of human capital of the workers in this household. The expected sign is negative.
- ***Women's participation in household decisions.*** Another empowerment variable captures the participation of women in the household's decisions about sending children to school. This is a dummy variable that takes the value of one, if the female borrower or the wife of the borrowing head participates in the decisions about sending the children to school, and zero, if she does not. The expected sign is negative, under the assumption that if women have an influence on the schooling decisions, there will be smaller education gaps.

These variables are used to explain the dependent variable in regressions run under different scenarios. First, the regression is run for the whole group of children, with ages between 6 and 18 years, and then it is run for the groups of the youngest potential students, with ages between 6 and 12 years, and of the oldest, with ages between 13 and 18 years. Regressions are estimated to address several comparisons across these groups: the comparison between credit with education and credit alone, the comparison between old and new village banking borrowers of FFH/CRECER, and the comparison between direct female clients and the wives/partners of male clients.

## VI. The data

The data come from a survey implemented by the authors in the municipality of Batallas. The sample included 130 households with at least one borrower from either SARTAWI or FFF/CRECER. Four separate sub-samples were interviewed:

1. Households of SARTAWI direct female clients (27 observations).
2. Households of SARTAWI wives of male clients (36 observations).
3. Households of CRECER new female borrowers —with less than one year in the program (33 observations).
4. Households of CRECER old female borrowers —with more than two years in the program (34 observations).

**Table 1. Composition by age of household member and type of borrower**

Age group of household members	SARTAWI		CRECER		Total
	Direct	Spouse	New	Old	
Primary school age (6-12 years)	37	53	39	51	<b>180</b>
Secondary school age (13-18 years)	27	41	25	42	<b>135</b>
School age (6-18 years)	64	94	64	93	<b>315</b>
Other ages	83	117	129	120	<b>449</b>
Total	<b>147</b>	<b>211</b>	<b>193</b>	<b>213</b>	<b>764</b>

Source: Client household survey, 2001.

These households include 764 members, for a household average size of 5.9 members. The age composition of the households in the sample is shown in Table 1.

**Table 2. Education gaps in the sample of children**

Education gap (years)	Observations (number)	Cumulative (%)
0	187	59.4
1	60	78.4
2	22	85.4
3	9	88.3
4	10	91.4
5	9	94.3
6	4	95.6
7	3	96.5
8	6	98.4
9	4	99.7
10	1	100.0
All	<b>315</b>	

Source: client household survey.

The results for the dependent variable, the education gaps, are presented in Table 2. The mean education gap is 1.13 years, for all children between 6 and 18 years old, a group of 315 girls and boys. This gap ranges from zero to ten years. The standard deviation is 2.04 years. The results in the table imply that 41 percent of these children show some delay or deficiency in their education, although for most of them the gap is only one or two years.

**Table 3. Average values for key variables, according to group of borrowers**

VARIABLE	CRECER NEW	CRECER OLD	SARTAWI DIRECT	SARTAWI SPOUSE
<b>General</b>				
Age of the borrower (years)	34	42	40	40
Household size (number)	5.8	6.3	5.4	5.8
Woman as household head (%)	6.1	11.8	25.9	2.8
<b>Isolation</b>				
(minutes needed to get to ...)				
Elementary school	15	13	9	10
High school	35	28	12	26
Labor training center	37	25	12	13
Paved highway	32	33	17	35
Not paved street usable the whole year	7	5	2	9
Bus stop	18	11	3	11
Market or fair used for business	34	23	31	30
<b>Land holdings:</b>				
Hold land for cultivation (%)	94	97	81	94
Area owned (hectares)	1.4	1.3	1.2	3.0
Own urban land without building (%)	18	12	26	31
<b>Housing and basic services:</b>				
Construction area (square meters)	64	66	88	80
Clearly defined property rights (%)	61	74	74	81
Number of rooms	3.0	3.4	4.3	4.0
Number of bedrooms	2.0	2.0	2.0	2.0
Bathroom with toilet (%)	61	56	41	44
Access to electricity (%)	63	91	96	78
Access to piped water (%)	67	62	74	61

Source: Adapted from Romero (2002), based on client household survey.

Table 3 shows relatively young families, scattered in the countryside around the village of Batallas. Most household heads are men, a dominant feature of the Aymara culture, but the proportion of female heads is significantly higher among female borrowers from SARTAWI. The high proportion of households with land holdings reflects their agricultural vocation. This is, again, less the case for the female borrowers of SARTAWI, who live closer to schools and roads. In general, SARTAWI borrowers are somewhat less rural, live in larger houses, and show more the absence of sewage facilities in the town of Batallas. New CRECER clients are more isolated and have less access to public utilities. Overall, the degree of access to basic public services is lower for this sample than on average in Bolivia.

**Table 4. Household labor force, according to groups of borrowers**

Type of client	Household Size	Actual Workers	Potential Workers	Actual workers (%)	Potential workers (%)	Actual/potential
SARTAWI Direct	5.4	3.4	2.7	63.3	49.0	1.29
SARTAWI Spouse	5.9	4.0	2.9	68.7	48.8	1.41
CRECER New	5.9	4.1	2.9	69.4	48.7	1.43
CRECER Old	6.3	4.1	3.2	65.7	50.2	1.31
TOTAL	5.9	3.9	2.9	67.0	49.2	1.36

Source: client household survey.

Results for the household's labor force are presented in Table 4. Almost one-half of all household members are of an age to work and therefore are potential workers (above 10 years old). A greater number of actual than potential workers implies that children below the age of 10 are working and that, with most adult household members also working, there is a demand for child care to be fulfilled by young household members. These features reflect a high opportunity cost for the poorer households to keep their children in school.

**Table 5. Average household human capital (years of schooling per worker)**

Type of client	Average human capital of all household members (a)	Average human capital of actual workers (b)	Average human capital of potential workers (c)
SARTAWI Direct	5.4	9.2	11.2
SARTAWI Spouse	5.1	8.3	10.5
CRECER New	3.9	5.7	7.9
CRECER Old	5.1	8.5	10.3
TOTAL	4.8	7.9	9.9

(a) Accumulated human capital of the household divided by the number of members in the household.

(b) Accumulated human capital of actual workers divided by the number of actual workers.

(c) Accumulated human capital of potential workers divided by the number of potential workers.

Source: client household survey.

The level of education achieved by each member of the household makes it possible to build different indicators of the human capital stock and, specifically, the average human capital per worker in the household. These averages are shown in Table 5. The households of new CRECER clients show less average human capital than the rest of the sample, while the households of direct female SARTAWI clients show the highest average levels of human capital. This possibly also reflects greater entrepreneurship among this latter group (Romero, 2002). The households of old CRECER clients and of male SARTAWI borrowers show similar levels of their stocks of human capital.

Following Navajas *et al.* (2000), an index of basic needs satisfaction was estimated and used as a proxy for poverty. For each household, the method weights unsatisfied basic needs, including housing, access to basic public services, access to health services, and education.

**Table 6. Poverty, according to an index of basic needs satisfaction (IBNS)**

	<b>CRECER NEW</b>	<b>CRECER OLD</b>	<b>SARTAWI DIRECT</b>	<b>SARTAWI SPOUSE</b>
Indigent (%)	55.9	60.6	33.3	41.7
Moderately poor (%)	44.1	39.4	48.2	41.7
In the threshold (%)	0	0	11.1	16.7
Non-poor (%)	0	0	7.4	0
IBNS (mean)	0.54	0.56	0.72	0.64
IBNS (median)	0.53	0.57	0.72	0.68
Adjusted IBNS (mean)	0.67	0.69	0.89	0.79
Adjusted IBNS (median)	0.66	0.69	0.90	0.84

Source: Computed from household survey according to Mapa de Pobreza.

Note: The adjustment eliminates the education component from the general index.

The method classifies households as non-poor, in the threshold of poverty, moderately poor, and indigent. Results for the index are shown in Table 6. All of the households of CRECER borrowers are below the official poverty line for 1992, with more than 50 percent in indigence. Four-fifths of the households of SARTAWI borrowers are below the poverty line. Only in the case of direct female clients of SARTAWI, there is a fraction of households above the poverty line. The mean and median of the index (IBNS) are significantly higher in this case. When it is calculated without including the educational component, the index increases in all cases. This shows that the educational component is very low for the Batallas population and pulls the index downwards.

**Table 7. Main statistics for the sub-sample of children (6-18 years old)**

<b>Variable</b>	<b>Type of borrower</b>				<b>Type of credit</b>		<b>All</b>
	<b>SARTAWI</b>		<b>CRECER</b>		<b>Only credit</b>	<b>Credit &amp; education</b>	
	<b>Direct</b>	<b>Spouse</b>	<b>New</b>	<b>Old</b>			
Observations (number)	64	94	64	93	117	198	315
Average education gap (years)	1.1	0.8	1.8	1.0	1.0	1.2	1.1
Average age (years)	11.5	11.6	11.4	12.1	11.8	11.7	11.7
Gender (% females)	42	50	47	53	43	52	49
Toddlers (%)	45	54	70	54	44	63	56
Direct son/daughter (%)	94	99	83	98	96	93	94
Average household human capital	10.8	8.6	5.9	8.8	9.9	7.7	8.6
Holdings of land (ha)	0.71	1.46	1.06	1.36	1.29	1.15	1.20
Basic needs index	0.85	0.79	0.65	0.66	0.86	0.66	0.74
Distance to elem. school (min)	10	12	18	13	12	14	13
Distance to high school (min)	11	26	43	41	19	38	31
Type of credit (% with education)	22	29	100	100	0	100	63
Women decisions (%)	92	89	88	84	92	86	88
Feminine worker human capital in the household (%)	35	47	39	46	39	45	43

Source: client household survey.

Table 7 shows the average values for the variables included in the regressions discussed here, considering the groups of children as statistical units, classified both according to the type of borrower and the type of credit. The last column shows the means for the whole sample of children. The education gaps are smaller for the children in the households of male SARTAWI clients and larger in the households of new CRECER clients. Average child ages are very similar across the sub-samples but there are noticeable gender differences. In the households of new CRECER clients there is a larger proportion of toddlers and less children are the direct daughters/sons of the CRECER client.

Table 7 also shows differences in human capital per household worker, holdings of land for cultivation, and basic needs satisfaction. The households of male SARTAWI clients are more endowed with human capital, live closer to most facilities, and show more satisfaction of basic needs, despite the absence of sewage in the center of the Batallas town. They are less rural and have less land for cultivation. About one-quarter of the SARTAWI clients have also had access to some credit with education program. The relative contribution of females to the income of the households of new CRECER clients is higher than in the other cases.

## VII. Econometric results

The regression analysis tested the dependence of the education gap on the explanatory variables in several different ways, according to four scenarios:

1. By type of credit. Minimalist credit versus integrated credit with education (old and new clients).
2. By sufficient access to credit with education. Borrowers with access to education versus borrowers without access to education (only old borrowers).
3. By influence of CRECER on its clients (old versus new).
4. By gender of borrower (female SARTAWI clients versus wives of male SARTAWI clients).

### *1. Analysis by type of credit: CRECER clients versus SARTAWI clients*

This set of regressions tests for the difference in education gaps between households that have access to credit with education (in this case, FFH/CRECER) versus those with access to minimalist credit (in this case, SARTAWI). For these regressions, 308 children from the survey are included; among them, 172 are between 6 and 12 years old and 133 are between 13 and 18 years old. The goal is to test the null hypothesis that the education component does not make a marginal difference in the size of the education gap. The results are shown in Table 8.

**Table 8. Results of regressions for the analysis on type of credit. CRECER versus SARTAWI clients.**

Variable	6 to 18 years old		6 to 12 years old		13 to 18 years old	
	Coefficient	Probability	Coefficient	Probability	Coefficient	Probability
Constant	-2.190	0.003	-3.981	0.002	-2.585	0.113
Type of credit	-0.173	0.448	-0.151	0.668	-0.515	0.092
Age	0.264	0.000	0.471	0.000	0.302	0.001
Gender	0.191	0.336	0.167	0.574	0.009	0.975
Direct son/daughter			-0.542	0.435		
Position	0.219	0.006	0.258	0.017	0.194	0.144
Toddlers					0.315	0.257
Distance to school			-0.015	0.215	0.000	0.909
Human Capital	-0.047	0.025	-0.029	0.359	-0.087	0.003
Land Holdings	0.052	0.208	0.022	0.758	0.116	0.043
Poverty Index	-1.394	0.002	-1.257	0.094	-1.275	0.026
Empowerment	-0.906	0.029	-0.389	0.530	-0.924	0.093
Over-dispersion	1.419	0.000	1.101	0.006	1.268	0.000
Observations	308		172		133	
Adjusted pseudo R2	0.198781		0.200117		0.110671	
Max. Likelihood	-396.447		-158.805		-219.913	

In the analysis pertaining to type of credit, for the whole sample as well as for the younger children, the coefficient for the *type of credit* variable is negative, but it is not statistically significant. The coefficient is negative and significant, however, for the older children. In the former two cases, we cannot reject the hypothesis that credit with education makes no difference compared to access to just credit. For the older children, nevertheless, this null hypothesis can be rejected. It appears, therefore, that, while there are no differences in education gaps for younger children —younger children are similarly sent to school by all types of households— there is a greater chance that the older children of households that participate in credit-cum-education programs will be kept longer in school in contrast with older children of households with just credit. Rejection of the null hypothesis does not preclude the possibility that other factors not considered in the analysis may be influencing this result.

As expected, the coefficient for the variable *age* is significant and positive. That is, the older the child, the greater the probability that she/he will show an education gap. The coefficient for the variable *gender* is not significant. This is an important result. Lack of statistical significance means that there are no differences between girls and boys in their educational achievements. The results cannot show if this gender neutrality has been due to the influence of these MFOs or not.

The presence of *toddlers* in the household does not show a statistically significant influence in its adverse effect (positive sign) on the possibility that the older children attend school.

The fact that the child is a *direct* daughter/son of the MFO borrower does not have a significant effect on the gap. That is, the potentially beneficial effect from the program is generalized to the entire group of children in the household and not only to the borrowers' daughter/son. In this case, the effect can be thought of as a positive externality of membership in the MFO program.

The *position* of the child compared to her/his siblings shows a positive and statistically significant effect on the education gap, especially on younger children. This supports the hypothesis that position within the family matters and that first daughters/sons are more likely to be sent to school than the last ones.

The results with regard to the sign for *distance* to the school are not as expected. For the case of distance to the primary school, the sign is the opposite of what was expected, but its statistical significance is poor. This suggests that distance is very similar for every child, as the supply of school facilities has expanded in proximity to all of these households. The coefficient for distance to the high school is not significant.

The household's stock of *human capital* (average levels of education of those who work) significantly reduces the education gap, especially in the case of the older children. This is not the case, however, for younger children, for whom the effect is not significant.

This suggests that there is a general awareness about the importance of sending young children to school, regardless of the education level of the parents. For older children, however, this effect is important. More educated household decision-makers have a greater propensity to encourage the secondary education of their children. This may be facilitated by the higher incomes earned by more educated household workers.

The coefficient on agricultural *land* holdings is positive and significant in the case of older children. For them, agricultural activities become a substitute or competition for education. This presents policy-makers with a paradoxical result: increased opportunities to farm may pull children away from school. To the extent to which farming households tend to be the poorest, this may create a poverty trap for these households.

The coefficient for the *poverty* index (IBNS) is significant and shows the expected sign. That is, the poorest households have children with greater education gaps. This may reflect the high opportunity cost of the child's school attendance in households with a low productivity of labor. In the absence of other productive household assets, expected returns from education will also appear low. Even minimum school expenses may seem beyond the household's budget constraint.

The *empowerment* variables show significant coefficients in the general regression but not for children 12 years old or younger. For older children (13-18 years old), the coefficient for empowerment is negative and statistically significant. Greater women empowerment reduces the education gap for older children.

In all the regressions, over-dispersion was observed, leading to the conclusion that the negative binomial regression model was the appropriate choice, in order to avoid over-rejection of coefficient significance. That is, without this adjustment, the significance of the coefficients would have been greater than reported here.

A comparison of the three regressions indicates a better explanatory power of the regressions for the whole group and for the group of children in ages from 13 to 18 years. The regression for children 6 to 12 years old has less explanatory power. This possibly reflects a wider access to education for this group of children. In general, few variables suggest significant differences across households for this age group. For the older children, in contrast, many of these variables show significant differences across households. The importance of this result depends on the effectiveness of secondary education in increasing labor productivity and future household incomes.

## 2. Analysis by sufficient access to credit with education

This classification of households aims to evaluate the influence of the education component on the household's education gap. Only old clients are considered, in order to control for access to credit over a period of time, so the observed differences can be explained in terms of access to the education component of the MFO program. The expectation is that the influence of education will be well established after two years of membership in the program. The two groups considered here are old CRECER clients and SARTAWI clients (direct and spouses).

**Table 9. Results of regressions for the analysis of sufficient access to credit with education**

Variable	6 to 18 years old		6 to 12 years old		13 to 18 years old	
	Coefficient	Probability	Coefficient	Probability	Coefficient	Probability
Constant	-2.929	0.001	-5.292	0.001	-1.401	0.437
Exposure to education	-0.170	0.497	-0.160	0.674	-0.641	0.052
Age	0.270	0.000	0.551	0.000	0.251	0.008
Gender	0.030	0.899	0.319	0.364	-0.405	0.220
Direct son/daughter			-1.487	0.162		
Position	0.285	0.006	0.379	0.008	0.099	0.534
Toddlers					0.050	0.881
Distance to school			-0.008	0.566	0.001	0.627
Human Capital	-0.030	0.198	0.010	0.778	-0.070	0.023
Land Holdings	0.035	0.471	-0.006	0.952	0.093	0.184
Poverty Index	-0.853	0.085	-0.703	0.374	-0.955	0.129
Women decisions	-0.569	0.130	-0.165	0.774	-1.010	0.041
Over-dispersion	1.581	0.000	1.029	0.024	1.318	0.000
Observations	251		141		110	
Adjusted pseudo R2	0.181		0.243		0.148	
Max. Likelihood	-297.170		-123.518		-163.120	

The marginal influence of the education component, found only in the case of the older children, is more significant when old clients exposed to this training as compared to old clients without this participation. This result supports the hypothesis that credit with education makes a difference on the schooling of high-school-age children. This finding makes it possible to reject the null hypothesis that membership in the program of credit-cum-education does not influence the education gap of the children in the client's household. All other explanatory variables retain their influence, except for the household's land holdings and index of basic needs satisfaction, whose influence loses significance. This may reflect influences from the credit components of the program.

### 3. Analysis for CRECER clients

These regressions attempt to test for differences between old and new CRECER clients, the only groups considered. This evaluates the effect of sustained membership in this MFO program. The assumption is that, after controlling for selection biases, because all clients have already been accepted by the village bank and have demanded loans, older clients will show the impact of the program on education gaps, as contrasted to recent clients, for whom the effects would not have yet taken place.

This exercise assesses the combined influence of credit with education on the children of these households. This group is made up by 157 children, among whom 88 are between the ages of 6 and 12 years and 66 are older than 12 years.

**Table 10. Regressions for CRECER clients**

Variable	6 to 18 years		6 to 12 years		13 to 18 years	
	Coefficient	Probability	Coefficient	Probability	Coefficient	Probability
Constant	-1.479	0.146	-3.088	0.078	-0.517	0.816
Old client	-0.516	0.056	-0.655	0.195	-0.671	0.045
Age	0.241	0.000	0.504	0.000	0.183	0.131
Gender	0.328	0.179	0.246	0.549	0.097	0.751
Position	0.173	0.077	0.190	0.130	0.029	0.857
Toddlers					0.364	0.275
Distance school			-0.023	0.129	-0.001	0.606
Human capital	-0.065	0.125	-0.041	0.547	-0.158	0.006
Land holdings	0.084	0.197	-0.081	0.505	0.226	0.003
Poverty Index	-2.147	0.005	-2.242	0.055	-1.511	0.105
Women decisions	-0.015	0.968	-0.579	0.350	0.097	0.802
Over-dispersion	1.097	0.000	0.837	0.063	0.574	0.016
Observations	157		88		66	
Adjusted pseudo R2	0.129		0.258		0.218	
Max. Likelihood	-218.822		-87.354		-109.918	

The dummy variable that differentiates between the households of old and new CRECER borrowers shows a negative sign and is statistically significant for the aggregate group and for the older children, as in earlier cases. This makes it possible to reject the null hypothesis that program influence does not matter. This regression results do not make it possible, however, to attribute the influence to any one of the two specific components: credit or education. The results described earlier suggest, nevertheless, that there is a positive marginal impact from the education component in the case of the older children, in addition to the influence that credit *per se* has. The current results show, therefore, that credit *per se* also matters for schooling decisions.

Most other coefficients behave as before. The coefficient for gender, however, is significant in the regressions for the aggregate and for the children of secondary school age, but it is not significant for those 12 years old and younger. This does not allow us to reject the hypothesis that there is gender discrimination at the high school level even among the households of CRECER clients.

As before, holdings of land for agricultural activities jeopardize the educational achievements of children, especially when they are older than 12 years of age. Apparently, the opportunity to generate present income by deploying child labor to farming is more attractive than the returns from additional education of these children, even in the case of CRECER clients, where a pro-education attitude may be stronger.

This reflects that poverty is quite deep among the population of Batallas and that, even under conditions of credit with education, parents are forced to take the children out of school to have them join the household's labor force for farming activities. This result is stronger, paradoxically because of the potential wealth effect, when the land holdings are larger, and the demand for labor, therefore, is stronger, and they contradict what Trigueros (2002) found in El Salvador. These observations are reinforced by the results for the coefficient related to the basic needs index. This coefficient is significant and negative in all cases, which implies that the deeper the level of poverty, the larger the education gap.

Finally, the coefficients for the empowerment variable are significant, except for the younger children. This lack of significance is not surprising, if one recognizes that, in general, the CRECER clients are women with some degree of empowerment, independently of the length of their relationship with the MFO.

#### 4. Gender analysis for SARTAWI clients

This test is performed to evaluate the difference between direct clients and wives of clients groups, so it can be used to test the effect of giving a loan to males vs. females.

**Table 11. Regressions for SARTAWI direct clients versus SARTAWI spouses**

Variable	6 to 18 years		6 to 12 years		13 to 18 years	
	Coefficient	Probability	Coefficient	Probability	Coefficient	Probability
Constant	-4.402	0.000	-6.980	0.000	-5.570	0.014
Direct client	0.823	0.009	1.257	0.002	0.954	0.066
Age	0.304	0.000	0.418	0.000	0.308	0.009
Gender	-0.017	0.956	0.415	0.321	-0.297	0.535
Position	0.328	0.019	0.405	0.019	0.189	0.434
Toddlers					0.686	0.171
Distance school			-0.009	0.675	0.026	0.059
Human capital	-0.035	0.174	-0.052	0.190	-0.025	0.472
Land holdings	0.091	0.120	0.169	0.029	0.179	0.065
Poverty Index	-0.813	0.152	0.472	0.587	-0.415	0.613
Over-dispersion	1.398	0.000	0.297	0.542	1.333	0.005
Observations	158		90		68	
Adjusted pseudo R2	0.234		0.333		0.176	
Log. Likelihood	-176.176		-67.624		-102.817	

The coefficient that distinguishes the household of direct female clients of SARTAWI from those of male clients are significant, but the sign is the opposite of what was expected. This may reflect, nevertheless, another instance of household demands for child labor. Direct female SARTAWI clients are more frequently heads of household, are better educated than the rest of the sample and, according to Romero (2002), are more entrepreneurial. Eligibility for a direct SARTAWI loan suggests that they operate an important business venture. A potential result of their commitment to their enterprises may be that their children are kept from attending school, either to work in the microenterprise or to take care of younger children. Indeed, although the significance is still too poor, this is the case when the coefficient for the siblings variable came closest to significance. This paradoxical result parallels what was found for the holdings of agricultural land and offers policy-makers a very difficult challenge.

## VIII. Conclusions

Poverty in Bolivia and, particularly, in Batallas is dramatic. In the long term, the alleviation of poverty will require substantial improvements in education. While education achievements have been improving in Bolivia over the past decade, there is a consensus that additional emphasis on schooling is urgent (UNDP, 2001). The necessary expansion of the infrastructure of schools and other educational facilities will not be sufficient, however. As this study shows, at least in the municipality of Batallas, the distance to school is no longer a significant variable in explaining differences in educational achievements among children up to 18 years old.

Instead, the most significant constraints to educational achievements seem to emerge from the *demand* side of the education equation and seem to be influenced by the attitudes, opportunities, and constraints of poor rural household members. The regression results presented here confirm this perspective. If a clear diagnosis is a precondition for the adoption of appropriate policies, important lessons, corroborated elsewhere, emerge from this study. Its results suggest that programs that improve the income-generation capacity of households and their ability to withstand adverse shocks can positively shift the demand for education among poor rural households.

Consistent with the threat of a poverty trap, deeper levels of poverty are associated with a lower demand for education. The results for the basic needs satisfaction index in all cases confirm a significant and unfavorable influence of poverty on education gaps for the children of Batallas. This result is closely related to the influence of the household's stock of human capital on choices about additional human capital formation. Educated household workers generate a stronger demand for the education of household children than non-educated household members. Larger stocks of human capital are not only associated with higher household incomes but also with more optimistic perceptions about the returns from education. These outcomes reinforce the poverty trap: educated parents demand more education for their children; uneducated parents do not. Non-formal adult education, through MFO credit-cum-education programs, may in part offset these attitude biases.

The relationship between wealth levels and the demand for education may create, however, some policy dilemmas. First, greater access to land and, therefore, to opportunities for farming appear to increase the household's demand for child labor, as participants in the household's own productive activities. Land tenure policies, therefore, while increasing income opportunities for the households may, at the same time, increase the opportunity cost of keeping children at school. A similar effect was found with respect to the management of household enterprises by female clients of SARTAWI, and it possess similar dilemmas. These opportunity costs appear to be very high for households in Batallas, both poor and non-poor, which are willing to sacrifice potential future welfare in order to guarantee their satisfaction of current consumption.

The low productivity of labor in agriculture makes these households prefer the flow of present income from their plots of land and microenterprises against the future income generated by a better education of their children. Even when household members are aware of some advantages from educating children, given their precarious conditions, they may be forced to sacrifice the potential flow of future benefits to compensate for extremely low current income flows. If, further, there is the perception that current employment options do not reward investments in education, the best alternative is to keep children at the farm or microenterprise since early ages.

Unfortunately, at low levels of household income, this adverse impact of incentives to agricultural production and microenterprise development on the demand for education will be inevitable. Agricultural intensification policies, rather than land extensification, which substantially increase the productivity of available household labor and other resources and improve the returns on human capital, may be the only way out of this dilemma.

A similar dilemma results from the encouragement of microenterprise activity. As the nascent microenterprise demands the attention of older women in the household, an internal demand for childcare emerges and this demand will be met by keeping older children at home. This effect will be stronger in younger families, as a result of the larger number of toddlers and smaller number of adults in the household. The education component of MFO programs may have an impact on the spacing of pregnancies and on the total fertility rate of these women, and this may contribute to a reduction of this paradoxical threat to human capital formation (Romero, 2002).

The regression results imply a significant influence from the relationship with the MFO on the demand for schooling. Smaller education gaps were predicted for the households of older CRECER clients compared to newer clients and for CRECER clients in general compared to SARTAWI clients. Most likely, the most important influence of participation in the MFO programs operates through the *income* channel. The paper does not test, however, for the influence of the MFO loans on household incomes. Given the strong theoretical and empirical relationship between household income and the demand for education, nevertheless, to the extent to which the loans may have an influence on the level and stability of household incomes, this will be a strong channel for their influence on education gaps. The researchers' perception that the households of the Batallas clients are subject to credit constraints suggests strong opportunities to improve income flows.

Additional positive impacts are generally associated with greater women empowerment. Measurement issues have made it difficult to further test for this hypothesis. In general, it was observed that women are aware of the threats to their children's education opportunities (Romero, 2002). The precise channel linking empowerment, access to credit, and a demand for education is yet to be determined.

The third channel, through adult education to increase awareness of the importance of schooling for the children's welfare, was not significant for younger children but significantly explained the continued enrollment of children in secondary education. This seems to be one of the most important differences between the minimalist approach of SARTAWI and the integrated approach of FFH/CRECER in the case of Batallas in Bolivia.

The most evident policy recommendation is related to the importance of access to credit and other financial services that allow households to postpone or smooth their consumption, in order to allow them to improve their decisions about their children's education, viewed as an investment. These MFOs have been able to reach segments of the rural population that otherwise would not have access to these services and, to the extent to which they are cost-effective, this is a valuable development contribution. The sustainability and cost-effectiveness of these MFOs has not been evaluated, however, in this study.

## References

- Bardhan, P. and C. Udry. 1999. *Development Microeconomics*. Oxford: Oxford University Press.
- Barro, R.J. and L. Jong-Wha. 2001. International data on educational attainment: Updates and implications. CID Working Paper No. 42. Harvard University.
- Becker, Gary S. 1993. *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education*. Chicago: The University of Chicago Press.
- Behrman, Jere R. and James C. Knowles. 1999. Household Income and Child Schooling in Vietnam. *The World Bank Economic Review* 13 (2): 211-256.
- Behrman, Jere R. and Mark R. Rosenzweig. 2002. Does Increasing Women's Schooling Raise the Schooling of the Next Generation. *American Economic Review*, forthcoming
- Behrman, J., R. Pollack and P. Taubman. 1986. Do parents favor boys? *International Economic Review* 27 (1): 33-54 (February).
- Bils, M. and P. Klenow. 2000. Does schooling cause growth? *American Economic Review* 90 (5): 1160-1183.
- Deaton, A. 1997. *The Analysis of Household Surveys: A Microeconometric Approach to Development Policy*. Baltimore: The Johns Hopkins University Press.
- Duryea, S. and C. Pagés. 2002. Human Capital Policies: What they can and cannot do for productivity and poverty reduction in Latin America. Working Paper No. 468. Washington, D.C.: InterAmerican Development Bank.
- González-Vega, C. 1998. Do financial institutions have a role in assisting the poor? *Strategic Issues in Microfinance*, M. Kimenyi, R. Wieland, and J.D. Von Pischke (eds). Aldershot: Ashgate.
- Grootaert, C. and H. A. Patrinos (eds.). 1999. *The Policy Analysis of Child Labor: A Comparative Study*. Volume 1. New York: St. Martin's Press.
- Hashemi, S., S. Schuler and A. Riley. 1996. Rural credit programs and women's empowerment in Bangladesh. *World Development* 24 (4): 635-653.
- Jacoby, H. and E. Skoufias. 1997. Risk, financial markets and human capital in a developing country. *Review of Economic Studies* 64 (3): 311-335 (July).
- Jensen, Peter, and Helena Skyt Nielsen. 1997. Child labour or school attendance? Evidence from Zambia. *Journal of Population Economics* 10: 407-424.

- Kanbur, R. and L. Squire. 2001. The evolution of thinking about poverty. *Frontiers of Development Economics: the Future in Perspective*, G. Meier and J. Stiglitz (eds.). Washington, D.C.: The World Bank.
- Khandker, S. 1998. Fighting Poverty with Microcredit. Experience in Bangladesh. Washington, D.C.: The World Bank.
- Krueger, A. and M. Lindahl. 2000. Education for growth: Why and for whom? NBER Working Paper No. W7591. Cambridge, Ma.: National Bureau of Economic Research.
- Lardé de Palomo, A. and A. Argüello de Morera. 2000. La incorporación tardía de los niños rurales al sistema escolar: causas y posibles soluciones. *Boletín Económico y Social No. 177* (August). San Salvador: FUSADES.
- Lillard, Lee A. and Robert J. Willis. 1994. Intergenerational Educational Mobility: Effects of Family and State in Malaysia. *Journal of Human Resources* 29 (4): 1126-1166.
- McElroy, M. 1997. The policy implications of family bargaining and marriage markets. *Intrahousehold Resource Allocations in Developing Countries: Models, Methods, and Policy*, L. Haddad, J. Hoddinott, and H. Alderman (eds.). Baltimore: The Johns Hopkins University Press.
- Meyer, R. 2002. Track record of financial institutions in assisting the poor in Asia. Columbus, Ohio: Rural Finance Program, The Ohio State University. Prepared for the Capacity Building Seminar on the Role of Financial Intermediaries for Poverty Reduction, Singapore (March). Asian Development Bank Institute.
- MkNelly, B. and C. Dunford. 1999. Impact of credit with education on mothers and their young children's nutrition: CRECER credit with education program in Bolivia. Research Paper No. 5. Davis, California: Freedom from Hunger.
- Moffitt, R. 1991. Program evaluation with non-experimental data. *Evaluation Review* 15 (3): 291-314.
- Morales Anaya, R. 2000. *Bolivia, política económica, geografía y pobreza*. La Paz: Universidad Andina Simón Bolívar.
- Murdock, J. 1995. Income smoothing and consumption smoothing. *Journal of Economic Perspectives* 9: 103-114.
- Nanda, P. 1999. Women participation in rural credit programmes in Bangladesh and their demand for formal health care: is there a positive impact? *Health Economics* 8: 415-428.

- Navajas, S., M. Schreiner, R. Meyer, C. González-Vega, and J. Rodríguez-Meza. 2000. Microcredit and the poorest of the poor: Theory and evidence from Bolivia. *World Development* 28 (2): 333-346 (February).
- Patrinos, H. A. and G. Psacharopoulos. 1997. Family size, schooling and child labor in Peru: An empirical analysis. *Journal of Population Economics* 10:387-405.
- Phipps, S. and P. Burton. 1995. Social/institutional variables and behavior within households: an empirical test using the Luxemburg income study. *Feminist Economics* 1 (1): 151-174.
- Pitt, M. and S. Khandker. 1998. The impact of group-based credit programs on the poor in Bangladesh: does the gender of participants matter? *Journal of Political Economy* 106 (5):958-96 (October).
- Psacharopoulos, G. 1997. Child labor versus educational attainment: Some evidence from Latin America. *Journal of Population Economics* 10:377-386.
- Ravallion, M. 2001. The mystery of the vanishing benefits: an introduction to impact evaluation. *The World Bank Economic Review* 15 (1): 115-140.
- Ray, Debraj. 1998. *Development Economics*. Princeton: Princeton University Press.
- Romero, V. 2002. Impacto del microcrédito en la vida de las mujeres y sus hijos: análisis comparativo de casos de estudio de FFH/CRECER y SARTAWI en el municipio de Batallas. Master's thesis. Universidad Andina Simón Bolívar.
- Sallee, James. 2001. The effect of improved female status on child health: Empirical evidence from India. Winner, The Ohio State University Undergraduate Essay Competition.
- Schultz, T. W. 1961. Investment in Human Capital. *American Economic Review* 51 (1): 1-17 (March).
- Schultz, T. 1993. The role of education and human capital in economic development: an empirical assessment. *Economic Growth in the World Economy*, Horst Siebert (ed). Institut für Weltwirtschaft an der Universität Kiel.
- Thomas, D. 1990. Intrahousehold resource allocation. *Journal of Human Resources* 25 (4): 635-664.
- UDAPSO (Unidad de Análisis y Políticas Sociales). 2001. Índices de desarrollo humano y otros indicadores sociales en 311 municipios de Bolivia. La Paz: UDAPSO.
- UNDP (United Nations Development Program). 2001. *Human Development Report 2001*. New York: United Nations.