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Child Labor, School Attendance, and Indigenous Households:

Evidence from Mexico[++]

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Abstract: This paper uses panel data for Mexico for 1997 to 1999 in order to test several assumptions regarding the impact of a conditional cash transfer program on child labor, emphasizing the differential impact on indigenous households. Using data from the conditional cash transfer program, PROGRESA (OPORTUNIDADES), in Mexico, we investigate the interaction between child labor and indigenous households. While indigenous children had a greater probability of working in 1997, this probability is reversed after treatment in the program. Indigenous children also had lower school attainment compared with Spanish-speaking or bilingual children. After the program, school attainment among indigenous children increased, reducing the gap.

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1. Introduction

It is estimated that more than 120 million children around the world between ages 5 and 14 are working full time and are being paid for their work (Basu 1998). A vast majority of them live in less developed economies. A variety of policies have been recommended to deal with this situation, proposals that range from banning child labor through legislation to formalizing the contracts under which children work in order to improve their working conditions. One important question is which policies are preferred, and under what specific conditions. The answer to this question depends on the idea of the development process that both the analyst and the policymaker have.

Understanding the problems of development from an analytical perspective can give rise to policies that widen the set of possibilities for those facing adverse economic conditions. Research has focused on the causes of child labor more than on its consequences for the households and the economy as a whole. Several supply and demand forces affecting the quantity of child labor in the market have been identified in the literature.[1] Among the former are fertility decisions,[2] behavior toward risk in the absence of formal markets[3], conditions in the adult labor market,[4] and the incentives for the parents to have sources of support during old age. On the demand side the most important factor is the nature of the available technology and its change over time.

In the first part of the paper we present a static setting with altruistic parents to investigate the role of preferences and technology on the decision of parents to send their children to school as their income increases. We contrast a partial equilibrium case with a general equilibrium one, finding that the nature of the available technology plays a key role in determining the effect on child labor of exogenous increases in parents' wages and productivity. This is consistent with the empirical literature, as discussed in Grootaert and Kanbur (1995).

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[1] Two complementary pieces are Grootaert and Kanbur (1995) on the empirical side of the literature and Basu (1998) on the theoretical side.
[2] For example Lloyd (1994), Rosenzweig and Evenson (1977), and a recent example is Kahhat (2001).
[3] For example, Jacoby and Skoufias (1997).
[4] See Basu and Van (1998) and López-Calva (2001).

In the second part of the paper we propose a dynamic overlapping generations model with non-altruistic parents. After describing the environment we impose a social norm that requires intergenerational transfers and show that its sustainability is incentive-compatible across generations. Those transfers give the dynamic link between investment in schooling and future consumption for the parents, who otherwise would have no incentive to invest in their children's schooling. This dynamic model also allows us to characterize the steady-state level of human capital in the economy. The dynamic effects of the existence of child labor are then discussed. After discussing the relevant issues for child labor in Latin America, we move on to analyze the effect of the conditional cash transfer program, PROGRESA (now OPORTUNIDADES), on child labor among indigenous and non-indigenous children in Mexico, using data from the evaluation database.

There have been several attempts to evaluate the impact of PROGRESA in several dimensions, though close to nothing has been done in order to test the differential impact of the program on indigenous versus non-indigenous people (for a summary, see IFPRI 2000). Perhaps the only attempt in this respect is Parker *et al*. (2003), which provides an empirical estimation of the impact of language barriers in determining school achievement and the potential ameliorating role of bilingual education. By using large household data sets from PROGRESA, the authors find that, controlling for family resources and school quality, language represents an important barrier for indigenous schoolchildren. In particular, it is shown that there is a large gap in the educational performance of monolingual indigenous children relative to bilingual indigenous children and that bilingual primary schools narrow this gap. The results in the latter paper are rather consistent with our findings below.

2. Child Labor and Indigenous Peoples in Latin America

The indigenous peoples of Latin America live in extreme poverty. There are over 40 million indigenous peoples in Latin America, or about 8 percent of the region's population. Mexico has the largest indigenous population in the Americas, at over 12 million, or about 13 percent of total population. Access to formal education in Mexico has expanded in recent years, and improvements have occurred in indigenous areas. Nevertheless, educational levels remain higher in non-indigenous areas. In 2002, 12.8 percent of children between 6 and 14 years living in indigenous municipalities did not enroll in school and 32.5 percent of individuals older than 15 years did not know how to read or write (Instituto Nacional Indigenista 2002).

According to Psacharopoulos and Patrinos (1994), the child labor force is greater in indigenous areas than in non-indigenous areas. This can be partially explained by the rural concentration of the indigenous population. The impact of parental education is greatest in less indigenous municipalities. The household head employment conditions have a clear impact on a child's average educational attainment. Heads of household who work in non-agricultural pursuits, in either indigenous or non-indigenous areas, have children with higher levels of educational attainment than otherwise employed heads of household. The contribution of the income of working children to total family income is substantial.

As expected, the contribution of child labor to family income increases with age, while increasing educational attainment reduces the contribution. Child income plays a slightly greater role in total family income in indigenous areas than in non-indigenous areas. Also, indigenous children are expected to have a higher likelihood of being employed and not in school because of language problems, school access (distance) and "cultural" differences. Guarcello, Mealli and Rosati (2003) show that indigenous households have a lower school attendance and higher work participation rate than the rest of the population.

In the academic literature, the phenomenon of child labor is often analyzed in conjunction with mothers' fertility, especially for rural areas. Within the framework of fertility determinants and the economic value of children, it is hypothesized that children are economic assets of rural families in developing countries. These models are developed from the general household production theory. According to the quantity-quality trade-off for children hypothesis, the household demand for child quality, as measured by household investment in children's schooling, is expected to have a negative effect on its demand for child quantity.

An important distinction is made between child work for wages (or family enterprise work) and household work. Most children work in the sense that they help around the house and assist their parents. These activities help prepare the child for adult life and have many positive benefits. Child labor, however, implies something very different, including exploitation, overwork and deprivation of health, education and even childhood. This problem is made worse when working children are too young or put in very long hours. Ilahi, Orazem and Sedlacek (2000) explore the relationship between child labor and future adult earnings and poverty status. They find that indigenous individuals have a smaller future wage, less income, and are more likely to fall into poverty.

In a simple household production model, the supply of child labor is a function of the economic and demographic characteristics of the household, age and sex of the children, and the costs and returns of alternatives time uses of children. It is hypothesized that individual child characteristics such as age, sex and birth order will be important determinants of child labor. For example, the older the child is, the greater the probability of being employed. Also, indigenous children are expected to have a higher likelihood of being employed. Canagarajah and Coulombe (1997) find that there are some gender-based distinctions in the type of tasks performed by a girl and a boy worker; girls do more household chores, while boys are in the labor force.

Family characteristics have an important role to play in a child's decision to attend class or work. Father's education has a significant negative effect on child labor; the effect is stronger for girls than for boys. Patrinos and Psacharopoulos (1997) also find that the number of siblings not enrolled in school proves to be an important control variable in at least one specification of the empirical model. They also find that child labor is not always detrimental to school attendance. Besides, they find that rural residence and being indigenous both have a negative impact on age-grade distortion.

However, the largest factor determining age-grade distortion for indigenous children is employment. Indigenous children who work are much more likely to be older than the usual schooling age. Being indigenous and rural residence both have a large impact on the likelihood that the student also works. Their analysis shows that family size is important. To increase schooling attainment and performance of rural, poor and/or indigenous children, appropriate targeting mechanisms must be designed. Child labor is not affected by adult unemployment but it responds to adult wages. Higher social acceptance of child labor reduces the stigma and increases child labor (Freije and Lopez-Calva 2000).

Household factors are expected to exert considerable impact on child labor and school enrollment rates. Poorer families probably have more children because of a need for child labor and/or lack of out-of-school human capital investments. The composition of income is also a factor, as families in self-employment are more likely to utilize family labor. Since poverty is correlated with low schooling levels, in poor households parents cannot be expected to either provide their children with any meaningful assistance with their school work and/or provide a good home learning environment, thus contributing to child labor. Poorer families probably also are more likely to take their children out of school in times of need and then allow them to re-enroll.

Children of indigenous groups are less likely to work full-time or to work for wages compared to children of other groups (Patrinos and Grootaert 1999). They find that indigenous children are probably excluded from formal sector employment, just like their parents. Throughout Latin America children of indigenous groups are more than twice as likely to be working as other children. Children whose mothers are not in the labor force are more likely to work if they are indigenous. This makes indigenous children prime candidates for targeted programs to increase school attendance and decrease child labor. There must be an economic change in the condition of a struggling family to free a child from the responsibility of working. Subsidies can help provide this change. Poor families are able to recognize good quality schooling and are frequently prepared to sacrifice child labor in order to invest in a good education for their children.

School represents the most important means of drawing children away from the labor market. The question is, do incentive programs such as PROGRESA/ OPORTUNIDADES impact the indigenous population – at all, or the same as non-indigenous children, or more? Do incentive programs reduce child labor – and is there a differential impact for indigenous children?

3. Simple Theoretical Models

3.1 Static Analysis

Most of the previous literature on child labor includes static models in which parents are altruistic in the sense that they care about either their children's leisure or their children's schooling as such (Rosenzweig and Evenson 1977; Goldin 1989; Basu and Van 1998).[5] The introduction of some children's measure of welfare in the utility function of the parents seems difficult to avoid in a static setting, but can be relaxed in a dynamic setting with purely self-interested parents, as we shall show in this paper.

The first model we present follows the lines of the previous literature and aims at analyzing the effect of an increase in the wages of adults – via technological change – on children's labor force participation. We first see the effect in a partial equilibrium environment, when the household takes the wages as given. As a second step, we introduce a simple general equilibrium framework. The nature of the available technology turns out to play a very important role in determining the effects on child labor supply because of the substitution possibilities between child and adult labor on the production side, considering their relative productivities.

As has been mentioned above, we assume the "unitary model" of the household in the sense that the head of the household is the decision maker.[6] The preferences we assume are similar to those presented in Rosenzweig and Evenson (1997). They include an index of the standard of living of the household (*per capita* consumption) and the

[5] Jacoby and Skoufias (1997) present a dynamic model but it also includes human capital as a bequest that implies a higher utility for the parents.

[6] A discussion regarding the strengths and weaknesses of this assumption can be found in Grootaert and Kanbur (1995) and Basu (1998), *inter alia*.

leisure and hours of schooling of the children. We introduce the leisure of the decision maker, instead of the leisure of the children, in order to evaluate the effect of higher adult wages on labor force participation with heads of the household that are not purely altruistic, but selfish, in the sense that they value their own free time. The assumption of inelastic supply of labor by parents, which is made in other models for the sake of simplicity, implies a higher degree of altruism, as the parents always prefer to work and would never substitute their own labor with their children's. The utility function of the representative household in this model is, therefore:

$$U = U(c, l, s)$$

where c is an index of the welfare within the household – *per capita* consumption, l is the leisure of the household head, and s is the time the children attend school. We assume that $U_i > 0$, $U_{ii} < 0$, i=1,2,3 and U is strictly concave. Children and parents are endowed with one unit of time and we assume that each household has one child.[7] There are m households. The problem of the representative household is as follows:

$$Max \quad U(c, l, s) \quad (1)$$

$$s.t.$$

$$c \leq w_A L_a + w_I L_I$$

$$L_I + s = 1 \quad (2)$$

$$L_a + l = 1$$

where L_a and L_I are the supply of labor of adults and children, and w_A and w_I their respective wages. Let us make the following assumption:

AI. $U_{ij} > 0, i, j$=1,2,3; $i \neq j$.

The assumption only tells us that there is a certain degree of complementarity among goods in the preferences of the parents. In this partial equilibrium setting we get the following result.

Definition: A *non-exploitative* scenario is one in which $\dfrac{\partial L_I}{\partial w_A} < 0$.

[7] The introduction of the number of children would become more interesting in the dynamic setting, especially if we want to analyze fertility decisions.

Result 1: A *sufficient condition for the non-exploitative scenario to arise is the following:*

$w_A U_{sc} > U_{sl}$

Proof: See Appendix.

This result tells us that the *non-exploitative* scenario can hold with reasonable assumptions on preferences; as long as hours of schooling are a better complement of consumption than of leisure, the result is obtained.[8] If that is the case, as the wage increases, parents would increase the level of schooling instead of consuming more leisure. If this is the case, then we should expect that the transfers from PROGRESA/OPORTUNIDADES would imply a reduction in child labor.

In a general equilibrium setting we have to incorporate the decision of the firms and the condition under which the markets clear. The representative firm in the economy has a technology that allows for substitution between adult and child labor, which we consider, by simplicity, as the only factors of production. There are two productivity shifters for each type of labor, α for adults and γ for children. The equivalence factor between adult and child labor is thus given by $\frac{\gamma}{\alpha}$. We denote the amount of efficiency units of child labor used in production as $\widetilde{I}$ and the amount of efficiency units of adult labor by $\widetilde{A}$. The problem of the firm is:

$$Max \;\; f(\widetilde{A},\widetilde{I}) - w_A A - w_I I \quad (3)$$

$$s.t.$$

$$A \geq 0,\; I \geq 0$$

Where $\widetilde{A}$ represents the adult's labor in efficiency units (αA) and $\widetilde{I}$ has the same interpretation for children (γI). Let us suppose first that the head of the household solves

[8] In the case of Basu and Van (1998) there is a discreet jump in the marginal utility from hours of schooling as *per capita* consumption reaches the subsistence level, inducing a *more than proportional* jump in schooling at that point. Given that parents do not value their own leisure, the condition also holds trivially.

the problem presented above taking wages as given, without considering the problem of the firms.

Definition: An equilibrium for this economy as a set $\left(c^*, L_a^*, L_I^*, A^*, I^*, w_A^*, w_I^*\right)$ such that

1. c^*, L_a^*, L_I^* solve the household problem;
2. A^*, I^* solve the problem of the firm;
3. w_a^* and w_I^* clear the adult and child labor markets, respectively (i.e., w_a^* and w_I^* are such that $I^*(.) = m[1 - s^*(.)]$ and $\times\, L_a^*(.) = A^*(.)$[9]

We can now analyze what the effect of a change in the productivity shifter α would be in a general equilibrium setting. This can be seen as technological change that makes adult labor more productive in the production process and increases the wage that adults earn in that market.

Result 2: *The effect of an increase in the adult wage via technological change will be ambiguous, depending on the nature of the available technology and preferences. Let us assume, for example, the technology*

$Y = F(A, I) = \alpha A + \gamma I$

Assume that $U_{cc} = U_{ll}$. *Then a sufficient condition for* $\frac{\partial L_I}{\partial w_A} < 0$ *to hold is*

$U_{cc} > U_{cl}$

In their review of the available empirical evidence, Grootaert and Kanbur (1995) conclude that "today's technology can have ambivalent effects on the demand of child work." As can be seen in the Appendix, the conditions that have to be imposed on technology in a general form to obtain an unambiguous result would not have an economically meaningful interpretation. The most interesting thing to notice is that we cannot get an unambiguous result without specifying the technological conditions in the economy, specifically conditions related to the degree of complementary between the two

[9] The other market, the consumption good market, can be left out invoking Walras' Law, and the price can be normalized to 1.

types of labor. The reason is that as productivity of adults increase (a positive change in α) the demand for child labor would also change, changing the wages of the children and thus potentially inducing a different level of child labor in the economy. In the specific example shown above we are restricting the technology so that there is no complementary between inputs.[10] Given this technology, the preferences of the parents interact with the nature of the technology in such a way that a simple restriction on preferences (similar to the one described above) would give us the result.[11] The result obtained in Basu and Van (1998) is consistent with ours, for the condition on preferences holds trivially in the case in which parents do not value leisure. The nature of unskilled labor markets in the Mexican rural setting allows us to test for this effect using the PROGRESA/OPORTUNIDADES database.

The nature of the available technology is thus a key determinant of child labor force participation in this simple static setting. Actually, it plays an even more important role than preferences of the parents, which under mild conditions would result in reduction of child labor as adult wages increase, even for parents who value their own leisure. Let us analyze in the following section whether this result holds in a dynamic setting.

3.2 Dynamic Setting with Purely Self-interested Parents

The existence of child labor has dynamic economic implications, like those in terms of human capital investment and the evolution of aggregate human capital, with an effect on the growth possibilities for the economy as a whole. We follow the unitary model of the household. Jacoby and Skoufias (1997) used a dynamic setting, as they were interested in analyzing the use of children as a pool of assets as a consumption smoothing device in the absence of perfect credit and insurance markets. In that model it is assumed that parents care about the schooling of their children as such, in the form of a bequest of

[10] Despite the fact that we can find economically meaningful ways to argue in favor of complementary (adults as supervisors or managers, for example), it does not seem to be extremely restrictive to think of productivity corrected perfect substitution between adult and child labor.
[11] We use this example because it is the type of aggregation used in Basu and Van (1998).

human capital investment that enters the utility function of the head of the household.[12] The same assumption is made in all the static models, plugging hours of schooling of the children as an argument of the utility function of the parent.[13] Although in the static model this seems difficult to avoid, we eliminate those variables from the utility function in the dynamic setting. We set up a model in which parents are purely self-interested, as an extreme case, to analyze how much the results obtained in other models can be supported in this non-altruistic framework.

A dynamic setting gives us the right environment to work under those conditions. The only extra requirement is the existence of intergenerational transfers, which we impose as a social norm that can be sustained as an equilibrium. In this framework, parents will care about human capital investment as long as a higher level of human capital investment will affect their children's future income possibilities and thus their own economic well-being when they retire.

Let us assume an overlapping generations model with production. Individuals live three periods. A person born in t (t=1,2,…n,…) takes the hours of schooling and level of consumption during childhood as given (i.e., as chosen by his parent). The time the child spends out of school (1-s) is spent supplying labor in the child labor market. The money earned is collected by the head of the household, who is the only decision maker, as we want to be consistent with the unitary model of the household. When adult, the individual gives birth to a child and will supply inelastically the time endowment available to her. The adult here has to choose the level of consumption within the household, which implies choosing the hours of schooling of her child. The only arguments of the parent's utility function are her own consumption, during adulthood and old age. During the third period the agent retires and her capacity to generate income disappears. The old agent thus has to rely on a transfer of consumption units from her adult offspring. Therefore, during adulthood the agent decides on consumption for her child, own consumption and her retired parent's consumption. These decisions are made

[12] Strictly speaking they call it "final level of human capital" in the last period.
[13] Even in dynamic models like Glomm (1997), hours of schooling are introduced as an argument in the utility function of the parents. See also López-Calva and Rivas (2003).

for a given set of prices w_{At}, w_{It}. There is neither population growth nor bequests. Individuals are identical in terms of preferences.

Every model consists of an environment and a set of institutions. In our model, we add the existence of a social norm to the environment already described. The norm says: "*share a third of your income with your offspring during childhood, and a third with your retired deserving parent.*" Under this social norm, adults will choose c_t, which will be interpreted in what follows as *per capita* consumption within the household. The incentive compatibility of this social norm will be discussed below and we will prove that it can be sustained as an equilibrium in the inter-generational interaction game.

The representative adult problem is as follows:

$$Max_{c_t \in \Re_+} U(c_t, c_{t+1})$$

$$s.t.$$

$$c_t \leq \left[w_{at} + w_{it}(1 - s_t)\right]/3, t = 1,2.$$

$$h_{t+1} = ks_t$$

$$c_t, c_{t+1} \geq 0$$

Where $U(.)$ is the utility function representing the adult's preferences and $U_i > 0$, $U_{ii} < 0$, $i = 1,2, U$ is C_2 and time separable.

As in the original model by Diamond (1965), production is assumed to be carried out by perfectly competitive firms, which maximize profits every period, taking prices as given. The two inputs that are used in production are adult labor, measured in units of human capital (*H*) and child labor (*I*). The technology exhibits constant returns to scale. Given these conditions, we can sum up all firms and analyze only aggregate output, as a function of the aggregate amount of the inputs used in production:

$$Y_t = F(H_t, I_t)$$

Human capital accumulated during childhood is sold by the adults in the labor market. In this way, the intertemporal trade-off for parents is established: higher consumption today can be achieved only by sending the child to work more hours, which restricts his human capital available during the second period and thus reduces the consumption of the retired parent. The individual and aggregate states have to be consistent and this consistency rule establishes the evolution of aggregate human capital:

$$H_{t+1} = mh_{t+1} = mka_t$$

where m is the number of households in the economy, and k is a constant that we can interpret as the "quality" of schooling. The production function satisfies the *Inada* conditions.[14]

Definition: A *competitive equilibrium* for the economy is a sequence $\left(c_t, A_t^*, I_t^*, w_{at}^*, w_{it}^*\right)$, such that for all t:

1. *The representative adult problem is solved*

2. *The problem of the individual firms is solved*

3. *Child labor market clears:* $I_t = m(1-s_t)$

4. *Adult labor market clears,* $H_t = mh_t$

Profit maximizing behavior on the production side implies:

$$w_{At} = F_1(.)$$

$$w_{It} = F_2(.)$$

By plugging the constraints in the production function, making hours of schooling (a_t) the choice variable, we transform the representative adult problem into:

$$Max_{S_t \in [0,1]} U\left(\left[w_{At} ks_{t-1} + w_{It}(1-s_t)\right]/3\right), \left(\left[w_{At+1} ks_t + w_{It+1}(1-s_{t+1})\right]/3\right)$$

[14] These are

$$\lim_{H_t \to 0} F_2(.) \to \infty, \lim_{H_t \to 0} F_2(.) \to 0$$

$$\lim_{I_t \to 0} F_1(.) \to \infty, \lim_{I_t \to 0} F_1(.) \to 0$$

The first order condition gives us:

$$\frac{U_2(.)}{U_1(.)} = \frac{w_{it}}{kw_{At+1}}$$

This result tells us that the ratio of marginal utilities from consumption in the two periods has to be equal to the ratio of the price of extra consumption tomorrow (that is, the child wage you lose by sending him to school one more hour) divided by the price of current consumption (represented by the loss on tomorrow's adult wage by investing one less unit in human capital today).

This is a result with a very clear economic interpretation and interesting implications. Suppose we added a transfer to household income – some subsidy from the government, for example, that gives the possibility of higher consumption. In this simple framework we can see that under our assumptions in terms of the concavity of the utility and production functions, as well as the fact that parents do not value leisure, if the transfer is announced to be distributed during retirement, it should induce an increase in child labor supply in the economy. This is so because the adults would convert future consumption into current consumption, given the possibilities of exogenously-determined higher consumption when they are older. This result hinges on the non-existence of other mechanisms of consumption smoothing. A program of transfers like the one analyzed here took place in Bolivia with the so-called "Solidarity Bond" (*Bono de solidaridad*) that the government announced to distribute the benefits from privatization to poor retirees. Current transfers, however, would have the effect of a reduction in child labor.

In order to be able to analyze the schooling decisions in this framework, as well as the dynamics of human capital, we will assume specific functional forms. As a first example, we will assume a logarithmic utility function of the form:

$$U = \ln c_t + \beta \ln c_{t+1} \tag{4}$$

where β is the discount factor. We will assume a simple production function, where the inputs for production are both human capital, *H*, and "unskilled" or child labor, *I*, whose marginal productivities are α and η, respectively.[15] The production function is:

$$Y_t = \alpha H_t + \eta I_t \quad (5)$$

If we combine the conditions from our definition of equilibrium we obtain a second order difference equation that describes the dynamics of schooling decisions:

$$\eta^2 s_{t+1} - \eta\alpha k(\beta+1)s_t + \alpha^2 k^2 \beta s_{t-1} + \beta\alpha k\eta - \eta^2 = 0 \quad (6)$$

Result 3: *Let us denote the steady state level of schooling by* $s^* \neq 0$ *and for* $\eta > 1$*, if* $\beta\alpha k > \eta$*, the steady state level of schooling is positive.*

Proof: See Appendix.

The result is economically meaningful. Parents will always invest in schooling if the benefit from doing so – the discounted value of the extra unit of future consumption obtained by an extra unit of human capital – is greater than the cost of schooling, which is the unit of foregone current consumption. Assuming this condition holds, we can see, by doing simple comparative statics, what the effect of an increase in the adult's wage would be on schooling.

Result 4: In order for $\frac{\partial s^*}{\partial \alpha} > 0$ we need to impose the following condition:

$$2\beta^3\alpha k^2 - 1 > \frac{2\beta\alpha k}{\eta}$$

As shown in López-Calva (2003), the nature of the markets and the characteristics of the population in rural settings, such as the PROGRESA/OPORTUNIDADES communities in Mexico, makes the "informal retirement" scheme a reasonable assumption. That would be especially the case for indigenous groups.

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[15] The general form is $Y = \left[\alpha H^{\rho} + \eta I^{\rho}\right]^{\frac{1}{\rho}}$

4. Methodology

The initial logit/probit econometric approach to study child labor and school attendance to estimate the probability of an indigenous child going to school or/and work misses the relationship between the school and work decisions. The school and labor supply independence assumption is untenable. Therefore, more recent approaches deal with the interrelated nature of these events (see Freije and Lopez-Calva 2000).

We use two econometric models for dealing with the work/school multiple choice problem: multinomial logit and sequential probit. These multinomial logit and sequential probits have been used in a comparative study (Grootaert and Patrinos 1999).

The multinomial logit model assumes that the household assumes that it faces a single decision process choosing among a set of options. A sequential probit assumes that a household makes choices among the options in a sequential manner (see Freije and Lopez-Calva 2000 for further details). We also use the two models in order to check whether the results are robust to different estimation techniques. It should be highlighted that the estimated parameters of these models are not directly comparable. They refer to either conditional probabilities, to marginal probabilities, or to joint probabilities. We refer to the direction and significance of the effect and compare whether the direction of the effect, not its size, is the same across models.

The control variables sitting in $X_{i,k}$ are the same in the two models and can be classified into four groups. The first group consists of children's individual characteristics, the second includes characteristics of the head of the household and the third contains household characteristics. The fourth group of independent variables is of special importance because by testing its significance we test the validity of the hypothesis listed in the introduction. These variables are a set of three dummy variables for individuals that only speak an indigenous language, those that are bilingual, and those that only speak Spanish. The direction of the effect is a direct test of differences among indigenous and non-indigenous households.

We take advantage of the availability of panel data for these households and make a comparison between 1997 (before the program started) and 2000. For the sequential probit regressions we take three dependent dichotomous variables: first, it takes value 1 if the child goes to school and does not work; second, it takes value 1 if the child goes to school and works; and third, if the child does not go to school and works. We omit the case where the child does not go to school and does not work. We also run a multinomial logit equation for three cases of interest compared to a child that goes to school and does not work: the probability that the child goes to school and works, does not go to school and works, and does not go to school and does not work. Finally, we take several poverty and inequality measures among indigenous, bilingual and Spanish-speaking households for both years. For a better examination of the depth and severity of poverty in indigenous, bilingual and Spanish groups, the Foster-Greer-Thorbecke index is used.

5. Data Description

The data used here are the PROGRESA/OPORTUNIDADES survey instruments that ask the question whether the person speaks an indigenous language. They also include information on earnings, household structure, school, work and social transfers. Examination of this data set gives valuable policy information on whether or not government programs are useful for decreasing inequality, particularly by pulling up the lower tail of the distribution, where indigenous people largely reside. PROGRESA/ OPORTUNIDADES in Mexico is one of the most comprehensive demand-side financing (or conditional cash transfer) programs in the world. The program provides cash stipends to poor families in exchange for ensuring their children's school attendance. Parker and Skoufias (2001) indicate that PROGRESA has led to significant improvements in educational indicators and outcomes. In fact, the program has led to higher school attendance rates and lower school dropout and repetition rates. There is also evidence of reduced child labor. PROGRESA has nearly eliminated the school enrollment gap between rich and poor. Finally, PROGRESA is very cost-effective. PROGRESA, therefore, has the effect of increasing the income of poor households, which are largely indigenous in Mexico, especially in rural areas and the poor southern states. The excellent evaluations of PROGRESA have thus far not focused on the differential impact on indigenous peoples. Therefore, the objective of this paper is to analyze the impact of PROGRESA/OPORTUNIDADES on indigenous children's progress in school and work activities. The determinants of schooling and work will be modeled according to Grootaert and Patrinos (1999).

We use the ENCASEH97, ENCEL99N and ENCEL00N household surveys.[16] These surveys are part of a round of surveys to evaluate PROGRESA.[17] It consists of a base survey and six consecutive surveys of the same household in a three-year period. This panel data is representative of the rural disadvantaged populations with 20 to 2,500 individuals in 7 states. It includes approximately 138,000 individuals in 26,000 households in 506 localities, with 320 as the treatment group and 186 as the control group. It includes micro-data on household characteristics, especially those that refer to education and health. It includes demographic characteristics of the household, with individual information for all family members.

In both years, population is separated into three groups: indigenous, Spanish and bilingual. Indigenous is defined as people that only speak an indigenous language but not Spanish. Bilingual is defined as the people that speak both an indigenous language and Spanish. Finally, Spanish stands for people that only speak Spanish but not an indigenous language. Children are defined as individuals between 8 and 16 years.

For the description of changes in incidence before and after the program, the groups are also divided into control and treatment groups. As explained in Behrman and Todd (1999), the process by which the treatment and control samples were collected is as follows. First, a subset of localities in Mexico was chosen to participate in the experiment. Randomization is being implemented at the locality rather than at the household level because PROGRESA benefits such as improvements in local schools and

[16] ENCEL00N: Encuesta de Evaluación de los Hogares, November 2000; ENCEL99N: Encuesta de Evaluación de los Hogares, November 1999; ENCASEH97: Encuesta de Características Socioeconómicas de los Hogares, November 1997.
[17] Programa de Educación, Salud y Alimentación (http://www.progresa.gob.mx/).

health facilities are at locality, and therefore would be difficult to have both treatment and control groups in the same small locality. In selecting localities, the probability of being chosen is population weighted. This means that the PROGRESA household data subsamples are self-weighting. Since PROGRESA is targeted primarily at poor families, criteria for selection into the experiment are based on empirical measures of poverty within the locality. After selecting a subset of localities to participate in the evaluation, it was determined using poverty-related criteria, which households within each locality would be eligible to receive PROGRESA services. Finally, each locality is randomly assigned to be a member of either the treatment or control group. In localities assigned to treatment, all eligible households within the locality are offered and usually take advantage of PROGRESA benefits/services. In localities assigned to the control group, none of the households receive PROGRESA benefits/services. There was a 60 percent probability of being assigned to treatment and a 40 percent probability of being assigned to the control group; 320 localities ended up being assigned to the treatment group and 185 to the control group.

6. Descriptive Statistics

Child labor is higher among indigenous-monolingual populations.[18] Child labor incidence decreased from 16.3 percent to 7.4 percent between 1997 and 1999 (see Table 1). An overall decrease is noticed, which is higher among indigenous-monolingual children, while Spanish-monolingual children's labor supply decreased 8.2 percent, it decreased 8.9 percent among indigenous-monolingual children. As children grow older, child labor increases. The steepest change occurs in 1997 in the indigenous-monolingual group from 13 to 14 years with a 13.3 percent increase (see Table 2 and Figure 1). In 1997, indigenous-monolingual children have higher child labor incidence in all age groups except 16. Bilingual children have the lowest child labor incidence in all groups in 1997. The indigenous-monolingual group has a higher incidence for children between 8 and 12 years. An increasing child labor with age pattern is still noticed when we separate children in the treatment and control groups (see Table 3).

[18] An "indigenous-monolingual population" is a location where more than 30 percent of households report a household head that is indigenous-monolingual.

All groups had an overall decrease in child labor incidence. The higher effect was noticed in the 13 to 16 year age group Spanish monolingual treatment group with a 18.2 percent decrease in child labor incidence followed by a 15.7 percent decrease in the indigenous monolingual treatment group. For bilingual children the biggest decrease was 8.4 percent in the 13 to 16 year old treatment group. Child labor decreased for all groups comparing 1997 to 1999. It can be noticed that in all three groups child labor incidence decreased and differences between the treatment and control group narrowed.

Education is very similar for bilingual and Spanish-monolingual children at all ages. Bilingual and Spanish-monolingual children have a higher education level with respect to indigenous-monolingual children (see Table 4 and Figures 2 and 3). The biggest difference in years of education from 1997 to 1999 was for the 8 to 12 year-old indigenous-monolingual children. The differences in education between 1997 and 1999 increased with years in the 13 to 16 year old children group. There is an increase in education of 0.3 years for the 8 to 12 year-old children in the bilingual group and 0.8 for the indigenous-monolingual group.

7. Econometric Results

7.1 Differences in Child Labor between Indigenous and Non-indigenous Households

After estimating the regressions with the panel data, we do not find important differences in the predictive ability of the two models. The percentage of correct predictions in the multinomial logit is significantly above 85 percent. Comparing the different results allows us to check the robustness of the results to these assumptions. The same pattern of measures of fit was found for the data.

The results from the probit models are presented in Tables 5, 6 and 7 for the indigenous, bilingual and Spanish-speaking households for 1997, while those for 2000 are presented in Tables 8, 9 and 10. The results from the multinomial logit for 1997 are presented in Tables 11, 12 and 13 for the indigenous, bilingual and Spanish households, while those for 2000 are in Tables 14 through 16. These results are expressed in terms of probabilities compared to a comparison group. In this paper, the comparison group is children that go to school and do not work. Therefore, all coefficients should be interpreted as such. A negative coefficient should be interpreted as a decreased probability of a child's working compared to a child that goes to school and does not work.

Age, gender and being indigenous do have a significant effect on schooling and work decisions in every model. Older children are more likely to work and not attend school. Older children are also more likely to be in the not working and not going to school state. Girls are less likely to go both to school and work. However, it must also be said that girls are also more likely to stay in the no-school/no-work state than to go to school only as shown by the negative coefficient for gender both in the sequential model, the first two negative coefficients in the multinomial logit model and the positive third coefficient in the multinomial logit model. This evidence supports the findings of Canagarajah and Coulombe (1997) that state that girls do more household chores.

Among the characteristics of the household head, a more educated head increases the probability of a child going to school and decreases the probabilities of working, as shown by the first coefficient of the sequential probit model. A more educated head decreases the probability of a child to go to school and work, or not to go to school and work, or not to go to school and not working, compared to children that go to school and do not work, as shown by the multinomial logit model. A married or living in free union head increases the probability of a child to go to school and not work, as shown by the sequential probit model.

Household composition is another variable that shows significance in some cases. Interestingly, an increase in the number of children under the age of 12 decreases the probability of going to school and increases the probability of working in 1997. This evidence support the quality-quantity tradeoff for children hypothesis. The number of children between the ages of 12 and 16 years is not significant in most of the cases. The effect of the number of adults and elderly (above 60) varies among models, but an increase in the number of adults decreases the probability of both going to school and working.

The sign of the coefficients for the sequential probit change from 1997 to 2000 favoring the school and not working state among the poor. This supports the idea that parents will invest in schooling if the benefit from doing so is greater than the cost of schooling. Finally in the multinomial logit model poverty is not a significant factor compared to children that go to school and work. While in 1997 it decreases the probability to go to school and not to work, to go to school and to work, and not go to school and work, in 2000 it increases the probability to go to school and not to work and becomes insignificant for the other two states.

In 1997 indigenous children had a lower probability of going to school and a higher probability of working. This evidence supports the Guarcello, Mealli an Rosati (2003) hypothesis and Patrinos and Grootaert (1999) findings. It can be noticed that by 2000 these effects were reversed by the program (PROGRESA). As a result, by 2000 an indigenous child has an increased probability of going to school and a decreased probability of working, consistent with the non-exploitative scenario in the theoretical models above.

In the 1997 sequential probit model, an indigenous child has a lower probability of going to school and working, going to school and working and not going to school and working. By 2000, an indigenous child had a higher probability of going to school and working and a lower probability of not going to school and working. Recall that in the multinomial logit model all coefficients are probabilities with respect to the comparison group of children that go to school and do not work. In this model for 1997 an indigenous child has a higher probability of going to school and working relative to the comparison group, while in 2000 this coefficient becomes insignificant and, therefore, being an indigenous child is not a determinant for this condition. In this model for 1997 an indigenous child has no significant effect on either not going to school and working, and not going to school and not working, compared to the comparison group. In 2000 being an indigenous child decreases the probability of not going to school and working.

Work and schooling probabilities do not change as significantly or greatly for bilingual children as they do for indigenous children. In the sequential probit model, there were no changes for the probabilities of going to school and working or not. But a bilingual child had a higher probability of not going to school and working in 1997 while it has a lower probability in 2000. In the multinomial logit model there were no changes for the probabilities of not going to school, but a bilingual child has a lower probability of going to school and working in 1997, while this coefficient becomes insignificant in 2000.

Spanish speaking children did not experience changes in the signs for the coefficients of the model. In the sequential probit model a Spanish speaking child had an insignificant coefficient for working in 1997. These coefficients become significant in 2000: small but positive for the not going to school and working case and negative for the going to school and working case. The significance of the coefficients also changes for the multinomial logit. While the coefficients were positive for a child to go to school and work and not to go to school and not to work in 1997, they became insignificant for 2000. There were no changes for the no school and work coefficient.

As a conclusion, age, gender and being indigenous do have a significant effect on schooling and work decisions under every model and support previous findings. Girls are less likely to go to school or work. A more educated head increases the probability of a child of going to school and decreases the probabilities of working. A married or living in free union head increases the probability of a child to go to school and not work. An increase in the number of children under the age of 12 decreases the probability of going to school and increases the probability of working in 1997 while these effects become insignificant in 2000. Bilingual and Spanish speaking children did not experience as many changes in probabilities as the indigenous children, which means that the program has a stronger effect in the latter group. In all cases, there is support for the non-exploitative scenario shown in the theoretical model.

8. Conclusions

In the sample under analysis, child labor is higher for indigenous children. Child labor incidence decreased after PROGRESA/OPORTUNIDADES by 8 percent between 1997 and 2000. The higher effect was noticed for 15 year old indigenous children in the treatment group, with a 26 percent decrease in child labor incidence followed by a 25 percent decrease for the entire treatment group. Comparing 1997 and 2000, differences in child labor between the treatment and control group narrow. Education is very similar for bilingual and Spanish children at all ages, but higher with respect with indigenous children. This difference has decreased, especially for older age groups.

Older children are more likely to work and not attend school. Older children are also more likely to be in the not working and not going to school state. Girls are less likely to go to school or work. Among the characteristics of the household head, a more educated head increases the probability of a child of going to school and decreases the probabilities of working. Being married (or living in free union) increases the probability of a child to go to school and not work. The number of children under the age of 12 had a negative impact on the probability of a child going to school and a positive effect on working, but it becomes insignificant after the start of PROGRESA. Poverty does increase the probability of going to school and not working after treatment in the program. Bilingual children did not experience as many changes in probabilities as the indigenous (monolingual) children. Spanish speaking children did not show significant changes.

This analysis adds a new perspective on conditional-cash-transfer programs, while showing that, in the case of Mexico, the program had a robust differential impact on indigenous children, especially those who are bilingual. Moreover, it is consistent with findings in other papers related to indigenous schooling barriers, such as Parker *et al.* (2003), where monolingual indigenous children have a higher hurdle to overcome when compared with those who are bilingual. In principle, these results could also shed light on the causes and consequences of incorporating specific components targeted to indigenous people in conditional cash transfer programs in developing countries.

Appendix

Result 1: The first order conditions of the household problem are

$$c + w_A l + w_I s - w_A - W_I = 0$$

$$U_C - \lambda = 0$$

$$U_l - w_A \lambda = 0$$

$$U_s - w_I \lambda = 0$$

We will apply the implicit function theorem. We construct a system of equations that represent the derivative of each row from the first order conditions with respect to the wage of the adults. Once we have that we apply Cramer's rule to obtain the following:

$$\frac{\partial s}{\partial w_A} = -\lambda \frac{\begin{vmatrix} 0 & -1 & w_A \\ -1 & U_{cc} & U_{cl} \\ -w_I & U_{sc} & U_{sl} \end{vmatrix}}{\widetilde{H}} - (l-1) \frac{\begin{vmatrix} -1 & U_{cc} & U_{cl} \\ -w_A & U_{lc} & U_{ll} \\ -w_I & U_{sc} & U_{sl} \end{vmatrix}}{\widetilde{H}}$$

where $\widetilde{H}$ is determinant of the bordered Hessian from the first order conditions, which has to be negative. We have then that $\frac{\partial s}{\partial w_A} > 0$ if the first term above is bigger than the second one. This can be expressed as:

$$-\frac{\lambda}{\widetilde{H}}\left[w_I U_{cl} + w_A U_{sc} - w_A w_I U_{cc} - U_{hl}\right]$$
$$> -\frac{(1-l)}{\widetilde{H}}\left[U_{lc}U_{sl} + w_A U_{cl}U_{sc} - w_A U_{sl}U_{cc} - U_{sc}U_{ll} + w_I\left(U_{cc}U_{ll} - U_{lc}U_{cl}\right)\right]$$

Using the fact that U is concave, and the cross-partials are all positive, a sufficient condition for that inequality to hold is

$$w_A U_{sc} > U_{sl}$$

whose interpretation is given in the text.

Result 3: The steady state level of schooling is the particular solution to the second order difference equation

$$\eta^2 s_{t+1} - \eta\alpha k(\beta+1)s_t + \beta\alpha^2 k^2 s_{t-1} - \eta(\eta - \beta\alpha k) = 0$$

which is given by

$$s^* = \frac{\eta(\eta - \beta\alpha k)}{\left[\eta - \frac{\alpha k(\beta+1)}{2}\right]^2 - \frac{\alpha^2 k^2 (\beta+1)^2}{4} + \beta\alpha^2 k^2}$$

Thus $\beta\alpha k > \eta$, then $\alpha k > \eta$ for any $0 < \beta$. If $\alpha k > \eta$ and $\eta > 1$, both the denominator and the numerator are positive, so $s^* > 0$.

Moreover, $s^* = 0 \Leftrightarrow (\eta - \beta\alpha k) = 0$ but that would make the denominator also equal to zero, originating an indeterminacy in s^*.

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Table 1. Child Labor

Group	1997	1999
Indigenous-monolingual	16.3%	7.4%
Bilingual	11.6%	7.7%
Spanish-monolingual	14.9%	6.7%

Table 2. Child Labor by age groups

	1997		1999	
Group	8 to 12	13 to 16	8 to 12	13 to 16
Indigenous-monolingual	5.6%	30.6%	1.0%	15.9%
Bilingual	3.9%	22.6%	2.3%	14.7%
Spanish-monolingual	5.5%	27.5%	1.5%	13.5%

Table 3. Child labor in Treatment and Control Groups

	8 to 12 year-old children				13 to 16 year-old children			
	Treatment		Control		Treatment		Control	
	1997	1999	1997	1999	1997	1999	1997	1999
Indigenous-Monolingual	4.7%	1.1%	7.2%	0.9%	30.5%	14.8%	30.8%	18.1%
Bilingual	4.5%	2.2%	2.9%	2.5%	22.8%	14.3%	22.2%	15.1%
Spanish-Monolingual	6.5%	1.7%	3.9%	1.1%	29.3%	13.1%	24.7%	14.1%

Table 4. Average years of Education

Average years of education

	8 to 12 year-old children		13 to 16 year-old children	
	1997	1999	1997	1999
Indigenous-Monolingual	2.6	3.4	4.7	6.4
Bilingual	3.1	3.4	5.9	6.4
Spanish-Monolingual	3.3	3.4	6.0	6.5

Table 5. Sequential Probit, 1997, Indigenous

	(1) SsNw	(2) SsSw	(3) NsSw
Age of Child	-0.099	-0.033	0.084
	(76.12)**	(21.61)**	(23.71)**
Gender of Child	-0.005	-0.110	-0.392
(Female)	(0.85)	(16.72)**	(36.08)**
Gender of Head	0.033	0.040	0.072
(Female)	(2.19)*	(1.99)*	(2.28)*
Age of Head	0.002	0.000	0.001
	(4.80)**	(0.86)	(2.01)*
Education of	0.021	0.007	0.004
Head (in years)	(17.56)**	(4.65)**	(1.55)
Marital Status of	0.067	0.030	0.019
Head (Couple)	(4.47)**	(1.99)*	(0.70)
Number of children	-0.010	0.009	0.021
Aged less than 12	(5.88)**	(4.33)**	(6.00)**
Number of children	0.002	0.008	0.020
Between 12 and 16	(0.61)	(2.25)*	(3.00)**
Number of Adults	0.003	-0.018	-0.008
	(1.14)	(6.44)**	(1.86)
Number of Elderly	-0.007	-0.002	-0.007
(Above 60)	(1.15)	(0.32)	(0.51)
Poor	-0.034	-0.018	-0.051
	(5.46)**	(2.39)*	(3.95)**
Only speaks	-0.250	-0.069	-0.185
Indigenous language	(15.89)**	(5.98)**	(6.69)**
Observations	31298	9380	8131

Notes: Absolute value of z statistics in parentheses; * significant at 5%; ** significant at 1%; SsSw= Child is in school and works; SsNw=Child is in school and does not work; NsSw= Child is not in school and works; NsNw= Child is not in school and does not work

Table 6. Sequential Probit, 1997, Bilingual

	(1) SsNw	(2) SsSw	(3) NsSw
Age of Child	-0.099	-0.032	0.087
	(76.15)**	(21.13)**	(24.49)**
Gender of Child	-0.006	-0.111	-0.395
(Female)	(1.06)	(16.91)**	(36.22)**
Gender of Head	0.040	0.045	0.079
(Female)	(2.67)**	(2.21)*	(2.47)*
Age of Head	0.002	0.001	0.002
	(5.94)**	(1.40)	(2.58)**
Education of	0.023	0.008	0.007
Head (in years)	(19.00)**	(5.65)**	(2.54)*
Marital Status of	0.070	0.031	0.020
Head (Couple)	(4.69)**	(2.06)*	(0.72)
Number of children	-0.010	0.009	0.022
Aged less than 12	(5.53)**	(4.49)**	(6.17)**
Number of children	0.008	0.011	0.026
Between 12 and 16	(2.62)**	(2.84)**	(3.74)**
Number of Adults	0.002	-0.018	-0.007
	(0.97)	(6.43)**	(1.70)
Number of Elderly	-0.012	-0.004	-0.009
(Above 60)	(1.84)	(0.52)	(0.68)
Poor	-0.053	-0.024	-0.061
	(8.59)**	(3.06)**	(4.70)**
Bilingual	0.090	0.020	0.038
	(15.20)**	(2.48)*	(2.73)**
Observations	31298	9380	8131

Notes: Absolute value of z statistics in parentheses; * significant at 5%; ** significant at 1%; SsSw= Child is in school and works; SsNw=Child is in school and does not work; NsSw= Child is not in school and works; NsNw= Child is not in school and does not work

Table 7. Sequential Probit, 1997, Spanish-monolingual

	(1) SsNw	(2) SsSw	(3) NsSw
Age of Child	-0.098	-0.032	0.087
	(75.74)**	(20.97)**	(24.65)**
Gender of Child	-0.006	-0.112	-0.394
(Female)	(1.18)	(16.93)**	(36.15)**
Gender of Head	0.039	0.043	0.076
(Female)	(2.62)**	(2.12)*	(2.38)*
Age of Head	0.002	0.000	0.002
	(6.06)**	(1.24)	(2.40)*
Education of	0.024	0.008	0.007
Head (in years)	(19.78)**	(5.57)**	(2.39)*
Marital Status	0.070	0.031	0.019
Of Head (Couple)	(4.64)**	(2.01)*	(0.70)
Number of children	-0.010	0.009	0.022
Aged less than 12	(5.66)**	(4.37)**	(6.06)**
Number of children	0.007	0.009	0.023
Between 12 and 16	(2.14)*	(2.49)*	(3.33)**
Number of adults	0.002	-0.018	-0.008
	(1.01)	(6.45)**	(1.76)
Number of elderly	-0.011	-0.003	-0.008
(Above 60)	(1.70)	(0.44)	(0.63)
Poor	-0.047	-0.020	-0.055
	(7.61)**	(2.59)**	(4.20)**
Only Speaks Spanish	-0.044	0.006	0.008
	(7.58)**	(0.79)	(0.60)
Observations	31298	9380	8131

Notes: Absolute value of z statistics in parentheses; * significant at 5%; ** significant at 1%; SsSw= Child is in school and works; SsNw=Child is in school and does not work; NsSw= Child is not in school and works; NsNw= Child is not in school and does not work

Table 8. Sequential Probit, 2000, Indigenous

	(1) SsNw	(2) SsSw	(3) NsSw
Age of Child	-0.080	-0.003	0.057
	(67.98)**	(4.51)**	(21.59)**
Gender of Child	-0.025	-0.028	-0.254
(Female)	(5.00)**	(7.94)**	(29.80)**
Gender of Head	-0.025	0.006	0.038
(Female)	(2.43)*	(0.92)	(2.44)*
Age of Head	-0.001	0.000	0.001
	(2.43)*	(1.00)	(1.18)
Education of	0.014	0.002	0.000
Head(in years)	(12.84)**	(3.29)**	(0.14)
Marital Status of	0.031	-0.005	0.002
Head (Couple)	(3.62)**	(0.89)	(0.14)
Number of children	-0.008	-0.001	-0.001
Aged less than 12	(6.04)**	(1.51)	(0.68)
Number of children	0.004	0.001	-0.008
Between 12 and 16	(1.58)	(0.60)	(1.73)
Number of Adults	-0.010	-0.001	-0.006
	(6.05)**	(0.61)	(2.56)*
Number of Elderly	-0.033	-0.008	-0.021
(Above 60)	(6.67)**	(2.22)*	(2.67)**
Poor	0.024	0.003	0.023
	(4.12)**	(0.89)	(2.76)**
Only speaks	0.033	0.009	-0.049
Indigenous language	(2.49)*	(0.94)	(2.55)*
Observations	29891	7878	7668

Notes: Absolute value of z statistics in parentheses; * significant at 5%; ** significant at 1%; SsSw= Child is in school and works; SsNw=Child is in school and does not work; NsSw= Child is not in school and works; NsNw= Child is not in school and does not work

Table 9. Sequential Probit, 2000, Bilingual

	(1) SsNw	(2) SsSw	(3) NsSw
Age of Child	-0.080	-0.003	0.057
	(68.04)**	(4.43)**	(21.53)**
Gender of Child	-0.025	-0.028	-0.253
(Female)	(5.01)**	(7.97)**	(29.74)**
Gender of Head	-0.021	0.007	0.034
(Female)	(2.02)*	(1.12)	(2.22)*
Age of Head	-0.001	0.000	0.000
	(2.06)*	(1.16)	(0.96)
Education of	0.013	0.002	0.001
Head(in years)	(12.34)**	(3.11)**	(0.43)
Marital Status of	0.031	-0.004	0.001
Head (Couple)	(3.68)**	(0.84)	(0.09)
Number of children	-0.008	-0.001	-0.001
Aged less than 12	(6.01)**	(1.44)	(0.68)
Number of children	0.006	0.001	-0.008
Between 12 and 16	(1.95)	(0.68)	(1.79)
Number of Adults	-0.010	-0.001	-0.006
	(6.17)**	(0.58)	(2.55)*
Number of Elderly	-0.035	-0.008	-0.020
(Above 60)	(7.06)**	(2.32)*	(2.54)*
Poor	0.020	0.002	0.026
	(3.32)**	(0.57)	(3.00)**
Bilingual	0.038	0.008	-0.022
	(7.01)**	(2.38)*	(2.62)**
Observations	29891	7878	7668

Notes: Absolute value of z statistics in parentheses; * significant at 5%; ** significant at 1%; SsSw=Child is in school and works; SsNw=Child is in school and does not work; NsSw=Child is not in school and works; NsNw=Child is not in school and does not work

Table 10. Sequential Probit, 2000, Spanish-monolingual

	(1) SsNw	(2) SsSw	(3) NsSw
Age of Child	-0.080	-0.003	0.057
	(68.06)**	(4.45)**	(21.54)**
Gender of Child	-0.025	-0.028	-0.253
(Female)	(5.00)**	(7.97)**	(29.71)**
Gender of Head	-0.021	0.007	0.034
(Female)	(2.04)*	(1.10)	(2.18)*
Age of Head	-0.001	0.000	0.000
	(2.23)*	(1.10)	(0.94)
Education of	0.014	0.002	0.001
Head(in years)	(12.61)**	(3.20)**	(0.29)
Marital Status of	0.032	-0.004	0.001
Head (Couple)	(3.73)**	(0.84)	(0.05)
Number of children	-0.008	-0.001	-0.001
Aged less than 12	(5.99)**	(1.43)	(0.71)
Number of children	0.006	0.001	-0.009
Between 12 and 16	(2.07)*	(0.72)	(1.93)
Number of Adults	-0.010	-0.001	-0.007
	(6.05)**	(0.55)	(2.66)**
Number of Elderly	-0.035	-0.008	-0.020
(Above 60)	(7.06)**	(2.31)*	(2.52)*
Poor	0.018	0.002	0.028
	(3.01)**	(0.46)	(3.26)**
Only speaks	-0.041	-0.009	0.032
Spanish-monolingual	(7.77)**	(2.57)*	(3.84)**
Observations	29891	7878	7668

Notes: Absolute value of z statistics in parentheses; * significant at 5%; ** significant at 1%; SsSw=Child is in school and works; SsNw=Child is in school and does not work; NsSw=Child is not in school and works; NsNw=Child is not in school and does not work

Table 11. Multinomial Logit, Indigenous, 1997

	(1) SsSw	(2) NsSw	(3) NsNw
Age of Child	0.268	0.957	0.652
	(18.51)**	(55.77)**	(57.01)**
Gender of Child	-0.966	-1.016	1.065
(Female)	(14.58)**	(19.33)**	(25.21)**
Gender of Head	0.097	-0.068	-0.294
(Female)	(0.56)	(0.50)	(2.49)*
Age of Head	-0.006	-0.006	-0.008
	(1.64)	(1.87)	(3.10)**
Education of	-0.061	-0.136	-0.109
Head (in years)	(4.57)**	(11.71)**	(11.56)**
Marital Status of	-0.085	-0.370	-0.276
Head (Couple)	(0.53)	(3.00)**	(2.61)**
Number of children	0.146	0.119	0.003
Aged less than 12	(7.53)**	(7.52)**	(0.26)
Number of children	0.063	0.079	-0.009
Between 12 and 16	(1.87)	(2.62)**	(0.37)
Number of Adults	-0.182	-0.018	0.046
	(6.50)**	(0.95)	(2.90)**
Number of Elderly	0.021	0.004	-0.018
(Above 60)	(0.29)	(0.07)	(0.37)
Poor	0.030	0.033	0.292
	(0.42)	(0.60)	(6.30)**
Only speaks	0.364	0.051	0.163
Indigenous language	(2.20)*	(0.26)	(1.17)
Constant	-5.215	-13.876	-10.045
	(17.12)**	(44.48)**	(44.53)**
Observations	29928	29928	29928

Notes: Absolute value of z statistics in parentheses; * significant at 5%; ** significant at 1%; SsNw=comparison group; SsSw= Child is in school and works; SsNw=Child is in school and does not work; NsSw= Child is not in school and works; NsNw= Child is not in school and does not work

Table 12. Multinomial Logit, Bilingual, 1997

	(1) SsSw	(2) NsSw	(3) NsNw
Age of Child	0.275	0.971	0.665
	(18.83)**	(56.12)**	(57.44)**
Gender of Child	-0.967	-1.021	1.062
(Female)	(14.59)**	(19.36)**	(25.04)**
Gender of Head	0.075	-0.090	-0.316
(Female)	(0.44)	(0.67)	(2.68)**
Age of Head	-0.006	-0.006	-0.008
	(1.75)	(2.02)*	(3.31)**
Education of	-0.060	-0.132	-0.105
Head (in years)	(4.50)**	(11.35)**	(11.14)**
Marital Status of	-0.100	-0.386	-0.284
Head (Couple)	(0.62)	(3.12)**	(2.68)**
Number of children	0.145	0.118	0.000
Aged less than 12	(7.45)**	(7.45)**	(0.02)
Number of children	0.048	0.052	-0.037
Between 12 and 16	(1.42)	(1.70)	(1.53)
Number of Adults	-0.179	-0.019	0.047
	(6.40)**	(0.98)	(2.93)**
Number of Elderly	0.034	0.017	-0.002
(Above 60)	(0.48)	(0.29)	(0.05)
Poor	0.092	0.116	0.385
	(1.28)	(2.08)*	(8.17)**
Bilingual	-0.384	-0.565	-0.600
	(5.38)**	(9.81)**	(12.40)**
Constant	-5.180	-13.888	-10.044
	(17.06)**	(44.55)**	(44.51)**
Observations	29928	29928	29928

Notes: Absolute value of z statistics in parentheses; * significant at 5%; ** significant at 1%; SsNw=comparison group; SsSw= Child is in school and works; SsNw=Child is in school and does not work; NsSw=Child is not in school and works; NsNw=Child is not in school and does not work

Table 13. Multinomial Logit, Spanish-monolingual, 1997

	(1) SsSw	(2) NsSw	(3) NsNw
Age of Child	0.272	0.968	0.662
	(18.68)**	(56.07)**	(57.32)**
Gender of Child	-0.965	-1.022	1.062
(Female)	(14.57)**	(19.37)**	(25.06)**
Gender of Head	0.073	-0.095	-0.320
(Female)	(0.43)	(0.70)	(2.71)**
Age of Head	-0.007	-0.006	-0.009
	(1.82)	(2.14)*	(3.49)**
Education of	-0.063	-0.136	-0.109
Head (in years)	(4.73)**	(11.63)**	(11.56)**
Marital Status of	-0.098	-0.387	-0.284
Head (Couple)	(0.61)	(3.13)**	(2.68)**
Number of children	0.145	0.118	0.000
Aged less than 12	(7.45)**	(7.43)**	(0.00)
Number of children	0.049	0.049	-0.040
Between 12 and 16	(1.45)	(1.61)	(1.64)
Number of Adults	-0.178	-0.018	0.047
	(6.38)**	(0.95)	(2.96)**
Number of Elderly	0.032	0.017	-0.003
(Above 60)	(0.45)	(0.29)	(0.06)
Poor	0.085	0.119	0.385
	(1.18)	(2.13)*	(8.18)**
Only speaks	0.292	0.541	0.553
Spanish-monolingual	(4.32)**	(9.62)**	(11.83)**
Constant	-5.429	-14.361	-10.522
	(17.51)**	(45.30)**	(45.65)**
Observations	29928	29928	29928

Notes: Absolute value of z statistics in parentheses; * significant at 5%; ** significant at 1%; SsNw=comparison group; SsSw=Child is in school and works; SsNw=Child is in school and does not work; NsSw=Child is not in school and works; NsNw=Child is not in school and does not work

Table 14. Multinomial Logit, Indigenous, 2000

	(1) SsSw	(2) NsSw	(3) NsNw
Age of Child	0.365	1.067	0.613
	(10.38)**	(40.95)**	(6.96)**
Gender of Child	-1.060	-1.431	0.577
(Female)	(6.54)**	(18.61)**	(1.79)
Gender of Head	0.327	0.294	0.188
(Female)	(1.31)	(2.35)*	(0.30)
Age of Head	0.009	-0.000	-0.016
	(1.07)	(0.08)	(0.90)
Education of	0.005	-0.116	-0.260
Head (in years)	(0.17)	(7.99)**	(2.96)**
Marital Status of	-0.460	-0.166	0.035
Head (Couple)	(2.13)*	(1.59)	(0.07)
Number of children	-0.001	0.051	0.212
Aged less than 12	(0.04)	(3.05)**	(3.17)**
Number of children	0.051	0.048	-0.042
Between 12 and 16	(0.63)	(1.19)	(0.22)
Number of Adults	0.031	-0.027	-0.069
	(0.66)	(1.25)	(0.59)
Number of Elderly	-0.151	-0.047	-0.030
(Above 60)	(0.97)	(0.68)	(0.09)
Poor	0.056	-0.009	0.559
	(0.35)	(0.12)	(1.21)
Only speaks	0.112	-0.615	0.762
Indigenous language	(0.32)	(3.12)**	(1.40)
Constant	-8.991	-16.452	-14.077
	(13.96)**	(37.71)**	(8.84)**
Observations	23752	23752	23752

Notes: Absolute value of z statistics in parentheses; * significant at 5%; ** significant at 1%; SsNw=comparison group; SsSw=Child is in school and works; SsNw=Child is in school and does not work; NsSw=Child is not in school and works; NsNw=Child is not in school and does not work

Table 15. Multinomial Logit, Bilingual, 2000

	(1) SsSw	(2) SsNw	(3) NsNw
Age of Child	0.364	1.079	0.633
	(10.34)**	(41.05)**	(7.08)**
Gender of Child	-1.060	-1.436	0.544
(Female)	(6.54)**	(18.59)**	(1.69)
Gender of Head	0.334	0.235	0.113
(Female)	(1.34)	(1.87)	(0.18)
Age of Head	0.009	-0.002	-0.017
	(1.11)	(0.64)	(0.91)
Education of	0.003	-0.106	-0.273
Head(in years)	(0.11)	(7.27)**	(3.05)**
Marital Status of	-0.460	-0.183	0.020
Head (Couple)	(2.13)*	(1.75)	(0.04)
Number of children	-0.001	0.052	0.216
Aged less than 12	(0.03)	(3.15)**	(3.24)**
Number of children	0.053	0.022	-0.100
Between 12 and 16	(0.65)	(0.54)	(0.53)
Number of Adults	0.031	-0.026	-0.075
	(0.65)	(1.17)	(0.65)
Number of Elderly	-0.154	-0.016	0.032
(Above 60)	(0.99)	(0.24)	(0.09)
Poor	0.049	0.071	0.724
	(0.30)	(0.94)	(1.56)
Bilingual	0.064	-0.646	-0.970
	(0.44)	(8.73)**	(2.42)*
Constant	-9.006	-16.360	-13.975
	(13.97)**	(37.40)**	(8.82)**
Observations	23752	23752	23752

Notes: Absolute value of z statistics in parentheses; * significant at 5%; ** significant at 1%; SsNw=comparison group; SsSw=Child is in school and works; SsNw=Child is in school and does not work; NsSw=Child is not in school and works; NsNw=Child is not in school and does not work

Table 16. Multinomial Logit, Spanish-monolingual, 2000

	(1) SsSw	(2) NsSw	(3) NsNw
Age of Child	0.364	1.082	0.626
	(10.34)**	(41.04)**	(7.04)**
Gender of Child	-1.059	-1.447	0.539
(Female)	(6.53)**	(18.68)**	(1.67)
Gender of Head	0.333	0.234	0.137
(Female)	(1.33)	(1.86)	(0.22)
Age of Head	0.009	-0.002	-0.015
	(1.10)	(0.48)	(0.82)
Education of	0.004	-0.112	-0.278
Head(in years)	(0.13)	(7.61)**	(3.12)**
Marital Status of	-0.459	-0.198	0.011
Head (Couple)	(2.12)*	(1.88)	(0.02)
Number of children	-0.001	0.054	0.214
Aged less than 12	(0.03)	(3.24)**	(3.23)**
Number of children	0.054	0.013	-0.089
Between 12 and 16	(0.66)	(0.31)	(0.47)
Number of Adults	0.031	-0.030	-0.079
	(0.65)	(1.36)	(0.68)
Number of Elderly	-0.154	-0.015	0.007
(Above 60)	(0.99)	(0.22)	(0.02)
Poor	0.047	0.098	0.708
	(0.29)	(1.31)	(1.52)
Only speaks	-0.064	0.716	0.642
Spanish-monolingual	(0.44)	(9.92)**	(1.83)
Constant	-8.942	-17.072	-14.629
	(13.64)**	(38.32)**	(9.05)**
Observations	23752	23752	23752

Notes: Absolute value of z statistics in parentheses; * significant at 5%; ** significant at 1%; SsNw=comparison group; SsSw=Child is in school and works; SsNw=Child is in school and does not work; NsSw=Child is not in school and works; NsNw=Child is not in school and does not work

Figure 1. Child labor by age groups

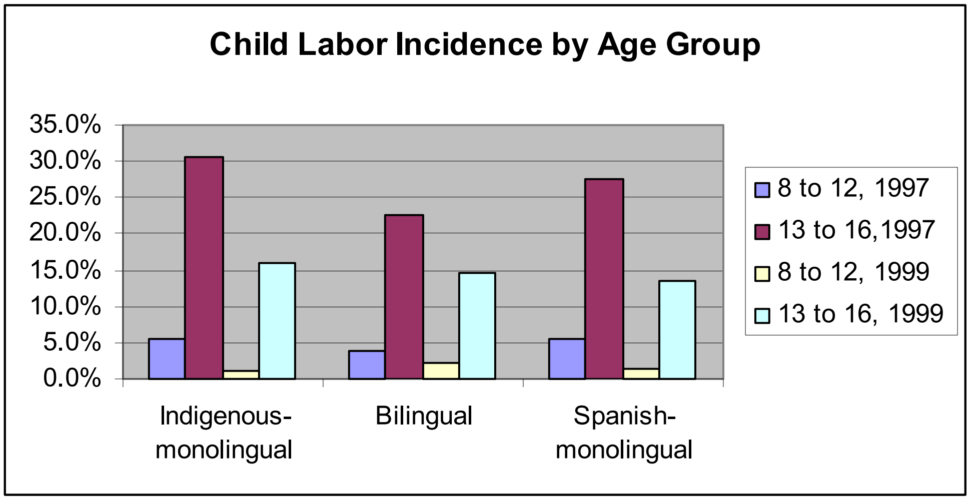

Figure 2. Average years of education

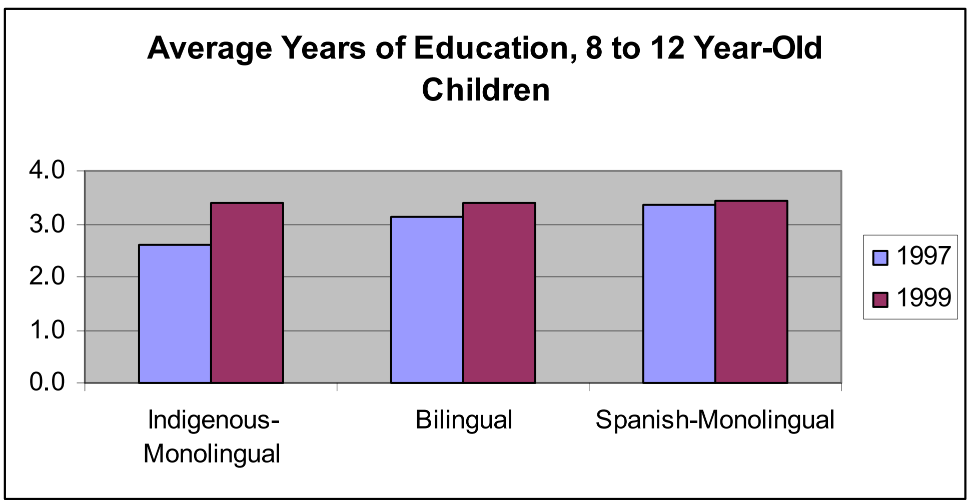

Figure 3. Average years of education