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The influence of the mother's power on her child's labor in Mexico

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Abstract

In order to understand what motivates parents to send their children to work, I apply a collective household model introducing child labor explicitly. Using data from Mexico, I estimate the mothers' bargaining power separately from the other parameters of the model. This parameter is then used in a second stage equation of children labor supply. I find that an increase in a mother's bargaining power is associated with fewer hours of work for her daughters but not for her sons. This implies that policies that target the mother as the recipient of welfare benefits, if they manage to affect the distribution of power within the household, may affect her children's work with different impacts for boys and girls. This result also suggests that the distribution of bargaining power within the household is a relevant factor that should be considered when analyzing household's decisions.

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1 Introduction

According to a March 2002 report of the International Labour Organization (ILO), approximately 352 million children aged 5 to 17 were engaged in some type of economic activity in 2000; over 211 million of these children were less than 14 years old. According to ILO statistics, participation rates in 2000 for children between the ages 5 and 14 were 29% in Sub-Saharan Africa, almost 19% in Asia and 16% in Latin America.[1]

In order to understand what motivates parents to send their children to work I apply a collective household model with child labor. I analyze the household's decision regarding the time allocation of children using a new and very detailed data set: the Mexican Family Life Survey (MxFLS). Specifically, I investigate the relationship between the mother's relative bargaining power and the amount of child labor allocated within the family. This analysis allows me to assess the potential effect of policies widely used in the developing world, that target the mother as the recipient of welfare benefits.

My work uses the collective household model as its foundation but augments it by introducing child labor. The model provides some clear theoretical predictions about the impact of the mother's bargaining power on her child's labor. One implication of this model is that if the mother obtains higher marginal disutility from child labor than the father, an increase in her bargaining power would lead to a reduction in the amount of her child's work.

A difficulty one encounters with this type of analysis is the need to actually estimate the bargaining power within the household, in addition to the other parameters of the

[1]Children at work in economic activity is a broad concept that includes unpaid, informal and illegal work. ILO distinguishes between child work and child labor, where the latter excludes children 12 years and older working only a few hours a week in permitted light work and children 15 years and above whose work is not considered "hazardous". Around 186 million children ages 5-14 were estimated to fall in this category. I use child work and child labor synonymously. Child labor estimations are taken from ILO (2002).

model. Identification under these circumstances is questionable. To overcome this, I separate the estimation of the bargaining parameters from the estimation of the other parameters of the model. To do so, I use survey information on which member of the household makes certain decisions about some key assets, like the house. The estimation of the bargaining power is a novel feature of this paper, as this kind of data is frequently not available in surveys. The usual way to proceed is to include exogenous variables, related to the distribution of bargaining power within the household, directly in the outcome equation. In this paper I first estimate the bargaining parameters and then use the estimated bargaining power in a second stage estimation of the child's supply of labor. I do so for a variety of definitions of a working child. I find that an increase in a mother's bargaining power is associated with fewer hours of work for her daughters, but not for her sons. Furthermore, I find that the distribution of power within the household affects only the amount of time that girls spend working at home. The results support the collective model as a better framework to analyze household's decisions compared with the traditional unitary model that assumes that households behave as a single agent. The results also suggest that the effect of welfare programs may depend on which household member receives the benefit.

The remainder of the paper is organized as follows. Section 2 summarizes the related literature. Section 3 presents the theoretical model. Section 4 describes the data. Section 5 presents the estimation strategy and the results and Section 6 concludes.

2 Related Literature

My paper is related to a diverse and wide literature. First, it is related to the literature on the effects of child labor on children's wellbeing.[2] Second, the paper is related to the literature that studies the impact of the distribution of power within the household on children's outcomes. This literature is based on the collective household model. This paper uses the collective household model as its foundation, introducing child labor explicitly. This model provides specific predictions about the impact of the mother's bargaining power on her child's amount of work.

This paper separates the estimation of the bargaining parameters from the estimation of the other parameters of the model. This has not been done before, as the usual way to proceed is to include some exogenous variables related to the distribution of bargaining power within the household directly in the outcome equation. In this paper I am able to identify the effect of the mother's bargaining power on her child's labor separately from the effect of the exogenous variables on the bargaining power.

A key concern about child labor relates to the potential harmful effects on children's health, given the hazardous activities that children are sometimes engaged in. However, data on these children are hardly collected in household surveys and most of the working children are not involved in hazardous activities. Several negative effects of child labor can still be mentioned. Specifically, the potential negative impact on children's education achievements that could lead to a reduction in their future welfare and perpetuation of poverty. For instance, Psacharopoulos (1997), using data from Bolivia and Venezuela, finds that a working child has on average a reduction of two years of schooling and a higher probability of grade retention. Gunnarsson, Orazem, and Sanchez (2006) analyze nine Latin-American countries, and find that child labor reduces student's achievements.

[2]For a complete survey of the child labor literature see Bhalotra and Tzannatos (2003)

Looking at children's performance on language and math tests, they conclude that child labor has a significant cost in terms of human capital accumulation.

Consistent with the idea that work affects children's educational achievements, the goal of some policies is to cover the cost of education, trying to reduce children's labor. Many of these programs target the mother based on the assumption that mothers tend to invest more in their children than fathers. In Mexico, the program Programa de Educacion, Salud y Alimentacion (PROGRESA) started in 1997. Initially, this program covered rural areas only, targeting the population in extreme poverty. In 2002 PROGRESA was expanded to urban population, with the name of Oportunidades. The goal of the program is to alleviate current poverty through monetary and in-kind benefits, but also to reduce future poverty by stimulating investments in education, health and nutrition. All the benefits go to the mother. The program transfers represented an average increase of 22% in the income of the beneficiary families. Regular attendance of the children to school is one of the key requisites in order to be eligible for benefits. Skoufias and Parker (2001) analyze the impact of PROGRESA on children's education and work. The results show negative impacts on children's labor market participation. Rubalcava, Teruel, and Thomas (2004) show that the additional resources to the families from PROGRESA are spent on children's goods, better nutrition and investments in small livestock (traditionally managed by women in Mexico).

Several empirical papers, focused on the distribution of power within the household, have found evidence that children are affected differently depending on the gender of the member receiving benefits. In a seminal paper, Lundberg, Pollak, and Wales (1997) exploit a change in UK Child Benefit policy in 1977 that transferred resources from fathers to mothers in two-parent households. They find an increase in the fraction of the budget spent on clothing by women and their children relative to the fraction spent before the

policy change. The authors conclude that a higher income held by the mother, holding total income constant, led to a different allocation of household resources. This new allocation tends to be beneficial to the children. Thomas (1990), shows that mother's unearned income has a significant impact on child survival probability. He also finds some evidence of gender preference: mothers prefer to improve the nutrition of their daughters and fathers of their sons. Thomas (1994) analyzes the relationship between relative parents education and child health (using height as an approximation for nutritional status). Relative bargaining power in the household is approximated with non labor income and the relative education of the parents. Using data from the United States, Brazil, and Ghana, he finds that daughters tend to be favored when mother's relative power increases.

More recently, Rangel (2006) using a legal change in alimony rights in Brazil, shows that more women's decision power positively affects investments in her children's education, especially for her first-born girls. Chowdhury, Khandker, Millimet, and Pitt (2003) analyze the impact of participation in group-based credit programs on the health status of children in rural Bangladesh. Women's credit is found to have a large and statistically significant impact on measures of the healthiness for both boys and girls. In contrast, credit provided to men has no impact on children's health. Duflo (2000) examines the impact of the expansion of the benefits and coverage of the South African social pension program to the black population in the early 1990's. She finds positive and significant effects on anthropometric status for girls when the recipient is a woman, but no effect when the recipient is a man. Galasso (1999) is the only paper that I am aware of that study the impact of the intra-household bargaining power on child labor. Using data from Indonesia, she uses transfers at marriage and assets brought to marriage to approximate parents' bargaining power. She finds that an increase in a mother's bargaining power is associated with a lower probability of child labor.

In sum, this literature suggests that the intra-household distribution of decision power is empirically relevant. Consequently, households that may look the same based on their characteristics, such as total income, can have very different allocation of resources. In particular, the relative power of the parents can lead to different decisions about investment in their children. This literature also suggests a possible gender preference: mothers tend to allocate resources in favor of their daughters, while fathers tend to do so in favor of sons.

In the literature, two types of models have been typically used to analyze household's decisions. The most common type are the unitary household models. Unitary models assume that all members have the same preferences or alternatively that one of the members makes the decisions for everyone else. In either case there is no role for the intra-household allocation of resources and consequently for the impact of intra-household bargaining power distribution on that allocation. Another class of models, are collective household models.[3] These models assume that households (generally conformed by individuals with different preferences) make Pareto efficient decisions. Different decision processes lead to different locations on the Pareto frontier, that correspond to different sets of weights for the household members. These weights summarize the decision process and reflect the relative bargaining power of each member.

In the first group, Basu and Van (1998) propose a model in which children work because they belong to poor families that need child work in order to survive (the Luxury Axiom). In the other group, Basu (2006) concludes that the relation between a woman's power and the amount of child labor is U-shaped. He argues that when one parent has most of the power, child labor is more attractive since the extra income can be allocated

[3]See Chiappori (1992) and Browning and Chiappori (1998) for a complete discussion of the collective model.

to the consumption of the powerful parent's favorite goods. Blundell, Chiappori, and Meghir (2005) extends Chiappori (1992) to include public goods, representing household's expenditures on children. They conclude that an increase in mother's bargaining power will have a positive impact on children's expenditure if and only if the mother's marginal willingness to pay for children goods is more sensitive to increases in private consumption than that of the father.

3 Theoretical Model

3.1 The Collective Model

As the main focus of this paper is the effect of parents' relative power on the amount of child labor, the collective household model provides the appropriate theoretical framework. I augment the model by including child labor in order to obtain theoretical predictions about the impact of the mother's bargaining power on her child's labor.

Browning and Chiappori (1998) show that for all Pareto efficient allocations there exists a set of weights such that the household utility function can be represented by a linear combination of all member's utility functions. The weights of each person's utility summarizes the decision process in the household. Given the individual utilities, the budget constraint defines the Pareto frontier and the weights the final location on this frontier. Each weight reflects each member's relative power in the household. This can also be thought of as a two stage process. In the first stage household members pool their incomes and reallocate the total income according to some sharing rule. In the second stage each member maximizes the individual utility subject to his/her own budget constraint. The share that each individual gets reflects his/her power in the household. The weights can be a function of prices as well as of non labor income and

the so-called distribution factors. These factors are defined as variables that can affect household behavior only through their impact on the decision process.[4]

Consider a general household's utility maximization problem, for a household that lives two periods and consists of two parents and one child.[5] The household makes Pareto efficient decisions.

$$\max_{c_1,c_2,l_f,l_m,h,s} \sum_{t=1}^{2} \lambda U_{mt}\left(c_t, l_f, l_m, h, z\right) + \left(1-\lambda\right) U_{ft}\left(c_t, l_f, l_m, h, z\right) \tag{1}$$

subject to

$$c_1 + \tau e + s = \sum_{p=m,f} A_p + \sum_{p=m,f} w_p(1-l_p) + w_c h \tag{2}$$

$$c_2 = (w - w_c)e + w_c + Rs \tag{3}$$

and

$$h + e + l_c = 1 \tag{4}$$

where U_m and U_f denote the mother's and father's utility respectively and λ corresponds to wife's weight in the household utility function. The term c_t denotes the aggregate consumption in period t. The leisure of parent p is denoted by l_p. Both parents care about the child's welfare, affected by the time allocation between education (e), work (h) and leisure of the child (l_c). Specifically, parents get disutility from sending the

[4]For instance, Chiappori, Fortin, and Lacroix (2002) use sex ratio as a distribution factor, Thomas (1990) uses non labor income, Thomas, Contreras, and Frankenberg (2002) use wealth at marriage. Other examples that have been used in the literature are: mother relative education, relative earnings, inherited wealth, access to credit.

[5]In the model I present, children do not make decisions, all the decisions in the household are made by the parents. At this stage fertility and living arrangements issues are not considered.

child to work. Finally, z is a vector containing the individual, household and community characteristics that affect parent's utilities.

In the first period household's income comes from parents non labor income (A_p), parents labor income ($w_p(1-l_p)$) and from their child's labor ($w_c h$). The price of the consumption goods are normalized to one. The term τ represents the cost of sending the child to school. In the second period the child works and her salary depends on the education received in the first period. The child's wage in the second period is $(w-w_c)e+w_c$. The wage increases with the amount of child's education. For example, if the child doesn't attend school in the first period, her salary remains constant at w_c. The household also recieves income from first period savings: s denotes savings and R the gross return on the household wealth.

The intertemporal household budget constraint is obtained by combining the budget constraints for both periods. It is given by:

$$c_1 + \frac{c_2}{R} + \left(\tau - \frac{w - w_c}{R}\right) e = \sum_{p=m,f} A_p + \sum_{p=m,f} w_p(1-l_p) + w_c h + \frac{w_c}{R} \tag{5}$$

and the time constraint for the child is: $h + e + l_c = 1$

Assumption 1 *Utility functions are increasing in consumption and leisure and decreasing in child labor, concave and twice continuous differentiable. Each parent utility function depends on the other parent's consumption but only additively.*

Assumption 2 *The cross derivative between consumption and child labor, $U^p_{c_1 h}$, is non-negative.*

The intuition of this assumption is that private consumption and sparing the child from

work are not complementary goods. A utility function separable in consumption and child labor, a usual feature in the literature, satisfies this last assumption.[6]

It can be shown that the model produces standard demand functions for consumption goods, leisure, education and child labor.[7] These functions depend on prices, wages, household resources, the distribution of power, and household characteristics (observable and unobservable).[8] Specifically for child labor:

$$h = h(\tau, R, w, w_p, A_p, \lambda) \tag{6}$$

The difference between these demands and those derived from a unitary model is the presence of the bargaining weights. The key empirical issue then, is to identify variables that affect the demand for goods only through the weights (the distribution factors mentioned above). Otherwise, it is not possible to disentangle the direct impact of the variable itself from the impact through the bargaining power.

In this paper the emphasis is on the effect of the mother's bargaining power on her child's labor. The first order condition for child labor equates the effect of child labor on parents utility to the effect of its impact on income:

$$\lambda U_h^m + (1-\lambda) U_h^f = -\gamma \left(w_c + \tau - \left(\frac{w - w_c}{R} \right) \right), \tag{7}$$

where U_x^p denotes the marginal utility of parent p with respect to x, and γ is the Lagrange multiplier in (5). For an interior solution the term $\left(w_c + \tau - \left(\frac{w-w_c}{R}\right)\right)$ needs to be positive. Using the first order condition for first period aggregate consumption, it

[6]Blundell, Chiappori, and Meghir (2005) for example, assume that leisure and consumption are separable from expenditure on children.

[7]A formal proof is contained in Browning and Chiappori (1998).

[8]See Mazzocco (2007) for a dynamic version of a related model.

follows that

$$\gamma = \lambda U_{c_1}^m + (1-\lambda) U_{c_1}^f. \tag{8}$$

Then, defining the function F:

$$F = \lambda U_h^m + (1-\lambda) U_h^f + \left(\lambda U_{c_1}^m + (1-\lambda) U_{c_1}^f\right) \left(w_c + \tau - \left(\frac{w - w_c}{R}\right)\right), \tag{9}$$

Using the Implicit Function Theorem I obtain the effect of the mother's bargaining power on her child's labor; namely

$$\frac{dh}{d\lambda} = -\frac{\frac{dF}{d\lambda}}{\frac{dF}{dh}} = -\frac{U_h^m - U_h^f + \left(w_c + \tau - \left(\frac{w-w_c}{R}\right)\right)\left(U_{c_1}^m - U_{c_1}^f\right)}{\lambda U_{hh}^m + (1-\lambda) U_{hh}^f - \left(w_c + \tau - \left(\frac{w-w_c}{R}\right)\right)\left(\lambda U_{c_1 h}^m + (1-\lambda) U_{c_1 h}^f\right)} \tag{10}$$

where U_{hh}^p represents the second derivative with respect to child labor and $U_{c_1 h}^p$ the cross derivative with respect to child labor and consumption. From assumptions (1) and (2), the denominator of the previous equation is negative. Consequently, the sign of the derivative is determined by:

$$sign\left(\frac{dh}{d\lambda}\right) = sign\left[U_h^m - U_h^f + \left(w_c + \tau - \left(\frac{w - w_c}{R}\right)\right)\left(U_{c_1}^m - U_{c_1}^f\right)\right] \tag{11}$$

The impact of the bargaining power on child labor has two components. The first one $\left(U_h^m - U_h^f\right)$ is the direct impact on parents utilities. Since both U_h^m and U_h^f are assumed to be negative, the sign of the derivative is negative if mother's marginal disutility for child labor is larger than that of the father's. Therefore, if the parent with larger marginal disutility for child labor has more power, the model predicts that child labor decreases with this parent's bargaining power.

The second component, $\left(w_c + \tau - \left(\frac{w-w_c}{R}\right)\right)\left(U_{c_1}^m - U_{c_1}^f\right)$, represents the indirect effect through the budget constraint. Both U_{c1}^m and U_{c1}^f are assumed to be positive, thus the sign is positive if mother's marginal utility for consumption is larger than the father's marginal utility. Therefore, if the parent with larger marginal utility for consumption also has more power, the model predicts that child labor increases with this parent's bargaining power.

4 Data

4.1 The Survey

The data comes from the Encuesta Nacional sobre Niveles de Vida de los Hogares, Mexican Family Life Survey (MxFLS) for 2002. This survey is conducted by Centro de Investigación y Docencia Económicas, A.C. (CIDE), Universidad Iberoamericana (UIA) and INEGI (Mexican Statistical Institute).[9] This is a new, ongoing, longitudinal survey of individuals, households, families, and communities in Mexico. It covers approximately 8,400 households and 38,000 individuals and it is representative at national, urban and rural levels from all states in Mexico. This multidimensional survey collects detailed information on asset ownership. Each household member answers questions regarding the ownership of household's assets and the decision making process related to those assets.[10] I use this information to obtain an estimation of intra-household bargaining power.

[9] See Rubalcava and Teruel (2004)

[10] The survey asks the respondent, which household's members participate in the decision regarding certain assets like the house and land in which the household lives, cars, electronics (like TV, VCR, computer), large appliances (like washing machine, refrigerator) and furniture, small appliances (like microwave, toaster, blender) or savings and financial assets. The typical question reads: "Which members of the household participate in case of buying/selling the house?"

The survey includes retrospective information about school attendance, and schooling levels of every household member. And crucial for this paper, time allocation and employment information of every household member, including children. It details the time children spend working (outside or at different tasks at home), studying or in leisure activities.

4.2 Summary Statistics

I consider children between 10 and 14 years old and I present two different definitions of working children. The first definition, a stricter one, includes only paid workers between 10 and 14 years old. The second definition, called broad, includes also children between 10 and 14 years old that work at least 10 hours per week.[11] The activities in which these children are involved, include agricultural activities, domestic housework, carrying firewood or water, or taking care of siblings or other members of the household. In the estimation reported below I use both definitions. In addition, for robustness checks, I also use a broader definition of child labor, namely children that work any positive amount of hours.

Table 1 shows the summary statistics, it includes the mean and standard deviation of each variable. There are 4,131 children between 10 and 14 years old in the sample. 12% of the children falls in the strict definition and they work on average 54 hours per week.[12] 47% of the children are working according to the broad definition, with an average workweek of almost 31 hours. There is a clear positive relationship between age and child labor. In fact, participation rates increase from 33% at 10 years old to almost 60% at 14 years old, using the broad definition.[13] A usual finding is that the distribution

[11]This is an arbitrary definition, that seeks to include children with relatively permanent workload.
[12]These hours include paid work plus all the activities mentioned above.
[13]Figure 2 showing participation rates by age and gender is included in Appendix 1.

of children on different types of activities depend on the child's gender. In this data, there are more working girls when using the broad definition but more boys under the strict one; 59% of the working children are girls under the broad definition compared to 36% under the strict definition. As expected, girls tend to work more at home and boys more outside, as paid workers. Working children (for both definitions) are significantly less able than non-working children; their parents are less educated than the parents of the non-working children. They belong predominantly to households with lower income and to rural households (27% of working children for the broad definition, against 18% in urban households). They are also less likely to attend school as it is also shown in the next table.[14]

One of the main concerns regarding child labor is the substitution between current schooling and the consequent effect on future wellbeing. Table 2 shows school attendance and work by gender for both definitions of working children. For this table I divide the children into four categories: work only; work and study; school only, and idle children (children that don't work and don't attend school). According to this table, the children that work outside the home (paid workers) reduce their school attendance. Only 80% of them attends school compared to 96% for the rest. For the broad definition the difference is not so large, since still 90% of them attend school.[15] However, it is important to emphasize that these figures reflect school attendance and not performance. It is reasonable to expect that even when working children attend school, their educational achievements are likely to be lower than non-working children's achievements.

Therefore, this first look at the data suggests that there are significant differences between working and non-working children. In Subsection 5.2 I investigate the source of

[14]The tests for the means always resulted in significant differences.

[15]Before the age of 13 the differences in years of education between working and non-working children are not significant. Working children aged 13 and 14 have less years of education than non-working children of their same age.

these differences estimating a child labor equation.

5 Estimation

5.1 Empirical Model

A general problem with this type of analysis is that it is necessary to estimate the bargaining power within the household along with the other parameters of the model. In this paper, I separate the estimation of the bargaining parameters from the estimation of the other parameters of the model. In this way I identify the effect of the bargaining power on the amount of child labor separately from the impact of the exogenous variables on the bargaining power. Some new questions in the data set allow me to do that. As mentioned above, the MxFLS includes questions about which member in the household makes decisions about different assets. There is information provided on who decides in the case of selling key assets like the house, the car, furniture, or appliances, among others.

The estimation then consists of two stages. First, I estimate the mother's bargaining power within the household, denoted by μ. Second, I estimate the impact of μ, estimated in the first stage, on her child's labor.

For each asset or decision a, I define the following variable:

$$y_a = \begin{cases} 2 & \text{if the mother decides} \\ 1 & \text{if both parents decide.} \\ 0 & \text{if the father decides.} \end{cases} \tag{12}$$

For each possible value of y_a I define a dummy variable:

$$d_{aj} = \begin{cases} 1 & \text{if } y_a = j \\ 0 & \text{otherwise} \end{cases} \tag{13}$$

for $j = 0, 1, 2$

Then, the individual likelihood function for decision a is given simply by

$$L_h = \prod_{j=0}^{2} Pr(y_{ah} = j)^{d_{ajh}} \tag{14}$$

for every household h

The probability of $y_a = j$ for $j = 0, 1, 2$, depends, among other variables, on the mother's bargaining power. The mother's bargaining power for each household (μ_h) is assumed to be a linear function of the distribution factors, that is,

$$\mu_h = z_h \theta \tag{15}$$

where z_h represents those variables affecting bargaining power but with no direct effects on the household members' utilities.[16]

In order to estimate μ, I need to partition the set of explanatory variables into two distinct sets. The variables contained in z_h, affect the decision through the bargaining power, while the variables in x_h affect the decision directly.

Using a multinomial logit model, then the individual household likelihood is given by

[16]In order to get a better approximation of the bargaining power, I estimate a polynomial function with interactions and squared terms of the distribution factors.

$$L_h = \prod_{j=0}^{2} \left(\frac{exp\left(z_h\theta + x_h\beta_{aj}\right)}{\sum_{j=0}^{2} exp\left(z_h\theta + x_h\beta_{aj}\right)} \right)^{d_{ajh}} \tag{16}$$

In this paper I utilize two decisions, therefore I have two variables: y_a and $y_{a'}$. The simultaneous estimation consists in a pseudo-log likelihood that is a weighted average of the log likelihood functions for each one of the decisions, namely

$$lnL_h^* = \alpha lnL_a + (1-\alpha) lnL_{a'} \tag{17}$$

The weight (α) is computed using the relative monetary values of the assets involved in each decision. However, as it turns out, the final results are robust to the choice of α. In Table 9 in Appendix 2, I include a sensibility analysis for different values of α. To further strengthen the results, I also include in Appendix 3 a robustness analysis using a wide range of decisions.

From this estimation I obtain $\hat{\theta}$, an estimation for θ in (16). Then, using equation (15), I construct an estimated value of μ for each household, i.e. $\hat{\mu}_h = z_h\hat{\theta}$.

In the second stage the household decision regarding child labor is analyzed. In this stage I use the estimated value for μ from the first stage as one of the regressors. I control for sample selection in the hours equation usging Heckman's selection model.

5.2 Results

For the first stage, I use the questions for two groups of decisions made by the members of the household. The first group includes electronic appliances including radio, TV,

computer, VCR, the second set is with respect to decisions about the house.[17]

Estimating the bargaining power via the decision questions requires variables that are suitable as distribution factors, i.e., variables that affect the distribution of power within the household, but do not have a direct effect on the individuals' preferences. Under this assumption, in the second stage I measure the direct impact of the relative bargaining power on child labor. I use the difference between husband's and wife's ages, and sex ratio as distribution factors.[18] Although in general wives are younger than husbands, wives are expected to have less power when their partners are much older than them.[19] Sex ratio captures the relative supply of men and women in the marriage market. If there are more men available, women tend to have more bargaining power.[20] I also include husband and wife education, cognitive capacity and background (measured by their own parents' education) since they may affect each partner's participation in household decisions. I also include a dummy variable taking the value one if the mother works outside the household, because housewives might be more likely to make decisions related to the house.[21]

Table 3 presents the results from the first stage estimation. As mentioned before, for this estimation I use two decisions, one about the house and one about electronic appliances.[22]

[17]I chose two groups of assets with an appropriate number of observations. The results are similar when using different weights or other decisions as it is shown in Appendices 2 and 3 respectively.

[18]Difference in age is defined as husband age minus wife age. Sex ratio is defined as men over women by states and 5 years age ranges, using data from INEGI. I tried using several other definitions of sex composition and the results are robust to these changes.

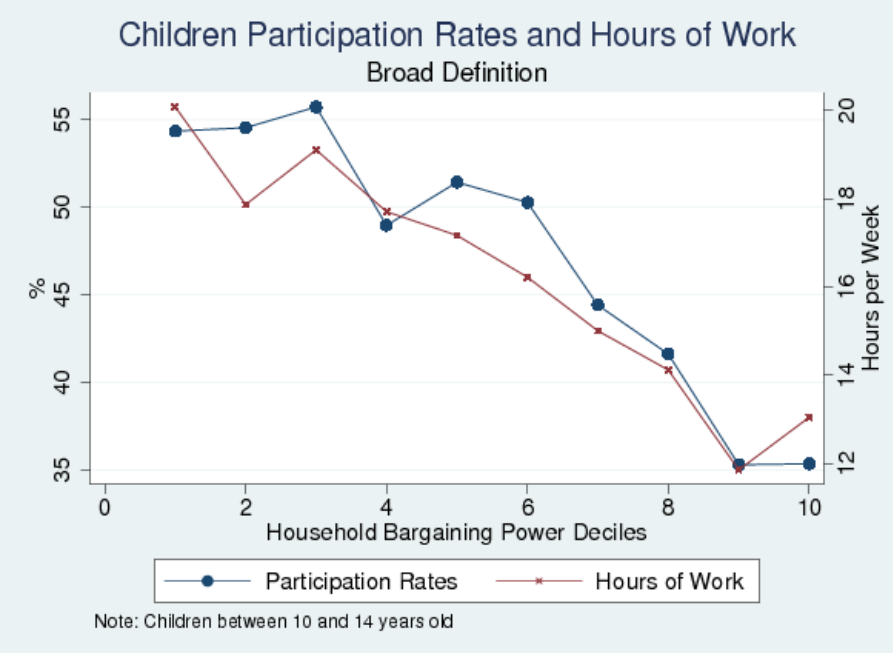
[19]The average age of a woman in the sample is about 3.5 years lower than her partner.

[20]Chiappori, Fortin, and Lacroix (2002) find that the state of the marriage market, reflected in the sex ratio and divorce laws, is an important determinant of the intra-household decision process. Angrist (2002) brings support to the idea that higher sex ratios increase female bargaining power in the marriage market.

[21]Some of these variables have been used in the literature as reflecting relative bargaining power. However, as it was mentioned above, a key empirical issue is to identify variables that affect child labor only through the weights. It might be argued that some of these variables may have a direct effect on child labor. Therefore, I am using as distribution factors variables that clearly do not have a direct impact on child labor.

[22]For brevity I include only the coefficients for the variables in the polynomial specification.

Figure 1: Participation Rates and Hours of Work by Bargaining Power



Both distribution factors are significant, especially the sex ratio. In order to get a better idea of the impact of each distribution factor, I compute the estimated effects of the distribution factors on the mother's bargaining power. The expected negative impact for the age difference implies that mothers who are younger than their partners are less likely to make decisions regarding household assets. In contrast, when there are more men available, women tend to have more bargaining power.[23] Using these coefficients I obtain an estimate for the mother's bargaining power in each household; the average estimated bargaining power is 45.7%, with a standard deviation of 14.0%. Figure 1 shows average participation rates and children's hours of work by deciles of bargaining power, using the broad definition of working child. It can be seen that participation rates in the labor force and hours of work decrease with the mother's estimated bargaining power.

[23]The effect is computed as the derivative of the bargaining power equation with respect to each distribution factor, evaluated at the average values. The results are robust to the inclusion of other regressors, to the use of different decisions and to the weights used in the estimation.

Table 4 reports results from the second stage estimation. In this stage I estimate a child labor equation using the model in Section 3 as a reference. The hours of child work are therefore regressed on the mother's bargaining power (estimated in the first stage), parents' education, household labor income, household wealth and a series of child, household and community variables.[24] These variables are the number of children in the household, birth order, child's age and gender, a dummy for the participation in PROGRESA and geographical dummies. The final sample consists of 2,811 children.[25]

I present different estimations, using a Heckman selection model with different selection rules, namely: (a) positive hours of work; (b) broad; and (c) strict definitions of child labor.

The results are consistent across all specifications. The coefficients for bargaining power are always negative. This implies that more bargaining power to the mother is associated with less hours of child labor. However, when using the strict definition of child labor the coefficient on the mother's bargaining power is insignificant. This implies that the distribution of power within the household does not seem to affect those children working for pay outside the household. In other words, when children work for significant number of hours, for pay, outside the home, it is a decision that seems to be made by both parents. Or it is mainly affected by other variables than the distribution of power within the household.

Focusing on Column 2 from Table 4 we can see that older children, and especially when they have more siblings tend to work more. As it was mentioned above, and it is shown in

[24]Household wealth is computed as the value of all the assets owned by the household.

[25]I also considered a few other specifications using distance to school (as a measure of the cost of attending school), number of students in the class (representing school quality), the score in an IQ test (as a measure of ability), fluency in Spanish, indigenous origin, household composition and different income and wealth variables. The results reported do not change qualitatively and those variables were not significant. I also verified that the results are robust when estimating the equation with less regressors in order to be able to use a larger sample.

Appendix 2, there is a clear increase in child labor with age. PROGRESA participation and education of the parents have, as expected, negative impacts on the amount of children's work. The same conclusions are obtained when looking at Column 1, that defines a child as working if he works a positive amount of hours.

The coefficient obtained for the broad definition of child labor (second column), implies that if a mother with no bargaining power gets all the power in the household, her child's labor is expected to be reduced by about 19 hours per week (recall that the average number of hours these children work is 31). We can see also that mother and father's education coefficients are not significantly different from each other. This does change when I split the estimation by gender.

Table 5 presents the child labor estimation for the broad definition divided by gender. Several important results are apparent. The effect of the mother's bargaining power is found to be significant only for girls. If a mother with no power gets it all, her daughter's workweek would be reduced by 29 hours. For the median household, with an estimated mother's bargaining power of 46%, the daughters' workweek would be reduced by up to 16 hours. This represents about 55% of the average girls' workweek. Additionally, the mother's education is significant in the girls equation, while father's education is significant in the boys equation. This result is consistent with previous literature that suggests that mothers tend to allocate more resources to their daughters, while fathers tend to allocate more resources to their sons. However, when disaggregating by gender the estimation for the strict definition, I do not find a significant impact. This is shown in Table 6. This implies that an increase in the mother's bargaining power does not benefit children working outside the household, not even girls.

As a robustness check I compare the children included in the final regression with those excluded for lack of data for the relevant variables that are used in the estimation. About

70% of the working children are included in the final estimation. The summary statistics comparing children, all children and working children under the broad definition, in and out of the final sample are provided in Table 7. The means for all the variables are not significantly different between the two groups. This suggests that the inclusion of the children missing in the final estimation wouldn't change the final results.

As an additional robustness check, for the bargaining power measure, I analyze the correlation between the decision questions and the ratio of husband and wife leisure. This ratio has been used in the literature as a proxy for the distribution of bargaining power. Table 8 shows that when women enjoy relatively more leisure, they also tend to be more active in household decisions, a result that is consistent with the literature.

6 Conclusions

Child labor is pervasive; for example, in Latin America approximately 16% of the children between the ages of 5 and 14 are working. While it may be that child labor is a necessity for the survival of some families, it is generally agreed that it has a large negative effect on the accumulation of general human capital. This is especially important for developing economies in which child labor is widespread, and children's development is crucial for the countries' economic growth. It is therefore vital to understand the effect of the household structure on child labor.

Using the well-known collective model of the household, I analyze the impact of women's bargaining power in the household, on children's amount of work. This allows me to evaluate the possible impact of policies that have been used around the world that direct welfare benefits to the mother. These policies follow the assumption that the mother cares more than the father about investment in the household's children and that

targeting benefits at the mother increases her bargaining power within the household.

A general problem with this type of analysis is that one needs to estimate a measure of the bargaining power within the household along with the other parameters of the model. In this study I am able to separate the estimation of the bargaining parameters. To do that, I utilize information provided in the data set regarding the household's decision making process with respect to several key assets. Using this data, it is possible to first estimate the bargaining parameters and then use the estimated bargaining power in a second stage estimation of the child labor decision.

I find that, in the Mexican case, the more bargaining power the mother has, the fewer hours of child labor. A further examination by disaggregating the estimation by gender reveals differential results for boys and girls. An increase in mothers' bargaining power has significant impact on their daughters' labor supply, while boys do not seem to be affected by the distribution of power within the household. Furthermore, mother's bargaining power significantly affects the amount of time her girls spend doing household chores. However, if girls work outside the household, they are not benefited from an increase in her mother's bargaining power. These findings suggest that the impact of welfare polices on children may be different depending on who actually receives the benefit (assuming that this benefit increases the relative power of the recipient). Finally, this paper supports the use of models that consider heterogeneity of preferences of different household members, in contrast with the traditional unitary models.

Table 1: Summary Statistics

	Broad		Strict	
	Working	**Non working**	**Working**	**Non working**
CHILD				
Hours of work	30.62	3.44	54.17	11.25
	21.05	3.31	24.20	12.65
School Attendance	0.90	0.97	0.80	0.96
	0.29	0.17	0.40	0.20
Ability[1]	-0.10	0.09	-0.13	0.02
	1.02	0.97	1.01	1.00
Number of Children	3.60	3.05	3.63	3.27
in the Household	1.66	1.50	1.76	1.57
Age	12.26	11.71	12.64	11.88
	1.36	1.41	1.31	1.40
Female	0.59	0.43	0.36	0.53
	0.49	0.50	0.48	0.50
HOUSEHOLD				
Mother's background[2]	2.11	2.84	1.97	2.56
	2.71	3.04	2.53	2.95
Father's background[2]	1.91	2.73	1.67	2.43
	2.71	3.03	2.50	2.95
Mother's years of education	5.34	6.23	5.02	5.91
	3.28	3.26	3.31	3.28
Father's years of education	5.41	6.33	5.11	6.00
	3.47	3.46	3.49	3.48
Household Annual Income	38,216	44,479	38,138	41,949
	829	879	1,631	655
Rural Household	0.27	0.18	0.27	0.22
	0.45	0.39	0.44	0.42
PROGRESA Participation	0.22	0.17	0.17	0.19
	0.41	0.37	0.37	0.39
No of observations	1,945	2,186	480	3,651
	47%		12%	

Note: Means and Standard Deviations are reported below. Children between 10 and 14 years old.

1 Ability reflects the score on an IQ test, normalized to have zero mean.

2 Parents background is given by their own parents years of education.

Table 2: School Attendance and Work by Gender (10 -14 years old)

Strict definition			
%	**Total**	**Boys**	**Girls**
Work only	3.73	3.05	4.40
Work and study	9.33	12.34	6.40
Study only	84.64	81.86	87.34
Neither work nor study	2.30	2.75	1.86

80% of working children attend school
96% of not working children attend school

Broad definition			
%	**Total**	**Boys**	**Girls**
Work only	4.12	3.34	4.87
Work and study	37.48	31.66	43.14
Study only	56.48	62.54	50.60
Neither work nor study	1.91	2.46	1.39

90% of working children attend school
97% of not working children attend school
Note: Strict definition includes only paid workers between 10 and 14 years old. Broad definition includes children between 10 and 14 years old that work at least 10 hours per week.

Table 3: Effect of Distribution Factors on Bargaining Power using House and Electronic Appliances Decisions

	θ **coefficients**
Age Difference	-0.083 (0.030)***
Sex Ratio	-5.40 (2.64)***
Age Difference*Sex Ratio	0.064 (0.220)
Age Difference squared	-0.0001 (0.001)
Sex Ratio squared	9.26 (1.10)**
No. Obs.	2,305
Age Difference Effect[1]	-0.024
Sex Ratio Effect[1]	11.84

Note: These are the θ coefficients corresponding to equation (17). Electronic Appliances include radio, TV, VCR, computer. Difference in age is defined as husband's age minus wife's age. Sex ratio is defined as the ratio of men over women by states and 5 years age ranges, using data from INEGI.

[1] The effect of each distribution factor is computed as the derivative of the polynomial function with respect to each distribution factor, evaluated at the average values.

Table 4: Child Labor Equation (Hours of work)
Heckman selection model

	Positive	**Broad**	**Strict**
Bargaining Power	-14.66	-19.38	-6.97
	(5.46)***	(9.23)**	(24.17)
Number of Children	3.23	3.98	1.52
	(0.43)***	(1.05)***	(2.01)
Birth Order	-2.76	-3.22	-4.12
	(0.64)***	(1.29)**	(0.9)***
Age	3.15	4.61	-1.04
	(0.42)***	(1.10)***	(4.22)
Female	1.51	0.23	11.18
	(1.70)	(2.88)	(7.01)
PROGRESA Participation	-2.14	-3.30	-3.23
	(1.14)*	(1.81)*	(3.11)
Mother's Education	-0.37	-0.56	-0.53
	(0.19)*	(0.30)*	(1.11)
Father's Education	-0.46	-0.69	-1.47
	(0.16)***	(0.28)**	(0.42)***
Household Labor Income	-0.85	-0.25	-0.89
	(1.56)	(1.07)	(4.76)
Household Wealth	0.17	-7.41	-16.54
	(4.51)	(19.50)	(67.82)
No. Obs. selection equation	2,811	2,811	2,811
No. Obs. hours equation	2,300	1,324	315

Note: Significantly different than zero at 99 (***), 95(**), and 90 (*)%. Bootstrap Standard Errors in parentheses. Children between 10 and 14 years old. Positive: defines working child as any child working a positive amount of hours. Broad: defines working child as any child working at least 10 hours per week. Strict: defines working children as paid workers. Bargaining Power estimated from first stage.

Table 5: Child Labor Equation by Gender (Hours of work)
Heckman selection model

	Girls	**Boys**
Bargaining Power	-29.44	4.85
	(9.93)***	(19.63)
Number of children	3.70	2.95
	(1.04)***	(2.27)
Birth Order	-3.62	-2.09
	(1.03)***	(1.02)**
Age	4.28	3.51
	(1.33)***	(1.94)*
PROGRESA Participation	-2.33	-3.66
	(2.02)	(5.36)
Mother's Education	-0.81	-0.09
	(0.37)**	(0.07)
Father's Education	-0.08	-1.22
	(0.29)	(0.70)*
Household Labor Income	-2.28	-1.50
	(5.78)	(17.00)
Household Wealth	-8.51	-3.43
	(11.42)	(21.23)
No. Obs. selection equation	1,422	1,389
No. Obs. hours equation	787	537

Note: Significantly different than zero at 99 (***), 95(**), and 90 (*) percent. Bootstrap Standard Errors in parentheses. Children between 10 and 14 years old, using broad definition of working child.

Table 6: Child Labor Equation by Gender (Hours of work-Strict Definition)
Heckman selection model

	Girls	**Boys**
Bargaining Power	-8.92	-2.36
	(11.82)	(12.78)
No. Obs. selection equation	1,460	1,426
No. Obs. hours equation	113	216

Note: Significantly different than zero at 99 (***), 95(**), and 90 (*) percent. Bootstrap Standard Errors in parentheses. Children between 10 and 14 years old, using strict definition of working child.

Table 7: Comparing All Children in the Sample to Children in the Final Estimation

Summary Statistics				
	All Children		Working Children–Broad	
	Whole Sample	Final Estimation	Whole Sample	Final Estimation
Age	11.97	11.96	12.26	12.23
	1.41	1.41	1.36	1.36
Female	0.51	0.51	0.59	0.59
	0.50	0.50	0.49	0.49
Ability	0.00	0.01	-0.10	-0.08
	1.00	0.99	1.02	1.03
Participation Rate	0.47	0.47		
	0.50	0.50		
Working Hours	16.25	15.94	30.63	29.97
	19.96	19.58	21.04	20.75
Mother's education	5.81	5.80	5.34	5.29
	3.30	3.28	3.28	3.29
Father's education	5.90	5.88	5.41	5.40
	3.49	3.52	3.47	3.51
No of observations	4,131	2,886	1,947	1,356
		69.8%		69.6%

Note: See Notes from Table 1

Table 8: Correlation between Different Measures of Bargaining Power

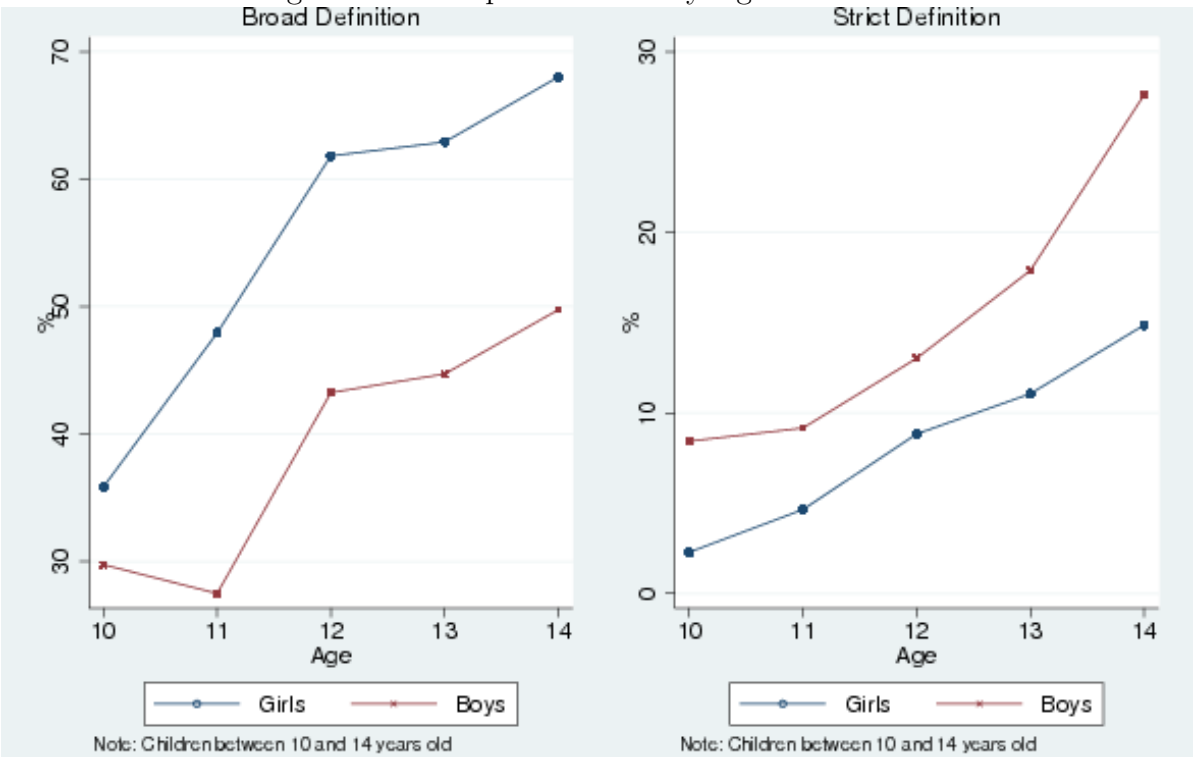
	House	Electronic Appliances	Leisure
House	1.000		
Electronic Appliances	0.391*	1.000	
Leisure	0.039*	0.048*	1.000

Note: Significantly different than zero at 99 (***), 95(**), and 90 (*) percent.

Appendix 1

There is a clear positive relationship between age and child labor. Participation rates, using the broad definition, increase from 33% at 10 years old to almost 60% at 14 years old. Using the strict definition, they increase from 5% to 21% respectively. As expected, girls participate more than boys when we consider household chores. The opposite happens when we consider only paid work.

Figure 2: Participation Rates by Age and Gender



Appendix 2

In order to check the robustness of the final result to the first stage estimation, I perform a sensitivity analysis. I estimate the impact of mother's bargaining power on child labor for different weights of the decisions used in the first stage.[26]

Table 9: Bargaining Power Coefficient for Different Weights in the First Stage

α	0.1	0.3	0.5	0.7	0.95
Bargaining Power	-24.00	-22.66	-18.13	-18.37	-18.40
Standard Error	(8.99)***	(8.77)***	(8.47)**	(8.30)**	(7.89)**

Note: α is the weight assigned to the house decision in the first stage estimation. Bargaining Power corresponds to the coefficient obtained in the child labor equation for the broad definition, comparable to column 2 from Table 4 ($\alpha = 0.95$).

Appendix 3

In order to evaluate if the results are merely an artifact of the particular decision variables chosen for the bargaining power estimation, I investigate the robustness of the estimations using a wide range of household decisions. There are two main conclusions. First, the estimation of the distribution of bargaining power within the household is robust to the inclusion of different decision variables. Second, in the specific context of child labor, the impact of the distribution of power is always significant, no matter which decision variables we use.

In this analysis I use two different sections of the survey. In one of these sections the survey asks the respondent which household's members participate in the decision regarding certain assets like the house and land in which the household lives, the car, electronics (like TV, VCR, computer), large appliances (like washing machine, refrigerator) and furniture, small appliances (like microwave, toaster, blender) or savings and financial assets. The typical question reads: "Which members of the household participate in case of buying/selling the house?" In another section of the survey, each household is asked about which members of the household participate in making other decisions like the food eaten in the household, clothes for each spouse, expenditures that represent a large share of the household budget, transfers to each spouse's family and each spouse's jobs. I use all these decision variables to test if the impact of the bargaining power variables affect them in a similar way.

[26]For briefness I show only some values for α.

In the first place I estimate one equation per household decision separately. The regressors included in each equation are education variables for both husband and wife, a dummy for the respondent's gender, the number of kids and adults in the household and geographical dummies. I use sex ratio as a distribution factor. Table 10 shows that most of the decisions are affected by this variable. The only decisions in which bargaining power appears not to have an effect are the food eaten at home, the car and savings. The fact that bargaining power does not affect these variables have different explanations. With respect to the decisions about the car and savings, they are concentrated in a small group of the population (higher income, more educated households), with less variation in the bargaining power variables. In addition, decisions related to the car are more likely to be made by men, for cultural reasons. Likewise, the husband rarely makes the decision about the food eaten at home. Furthermore, these decisions don't change with the education level of the household. This is interpreted as evidence that they won't be affected by the distribution of power within the household.

Most of the coefficients presented in Table 10 are highly significant. Moreover, they don't look extremely different. They mostly fall between 1.4 and 2. They range from 1.15 in the case of the husband's job to 3.11 in the case of children's education. Formal tests to compare the coefficients are presented in Table 11. I obtain them once I jointly estimate all the equations for which the bargaining power variables resulted to be significant. Table 11 presents the tests that compare the coefficients on the bargaining power variables across equations. These tests result from the comparison of the coefficient for each one of the decisions with the decision about expenditures that represent a large share of the budget. For all the decisions the conclusion is the same. We cannot reject the hypothesis that the coefficients on the bargaining power are the same across equations. This conclusion provides support to the robustness of the estimation to the particular decision variables chosen. This result is extremely useful if we want to estimate the distribution of bargaining power within the household using questions about the decision making process in the household. It implies that we shouldn't expect different results just because we choose to use or we have access to a different set of decisions.

In order to check the robustness of the final result to the bargaining power estimation, I estimate the impact of mother's bargaining power on child labor for different decisions used in the first stage. The procedure is as follows. In a first stage I estimate the bargaining power for each household using one different decision variable at a time. In a second stage I introduce the different estimated bargaining power variables in a child labor equation. Table 12 presents the coefficients that correspond to the effect of bargaining power on the hours of child labor for different bargaining power estimations. This is comparable to the results in the second column of Table 4. Table 12 shows that although there is variation in the coefficients obtained, the conclusion about the impact of bargaining power on child labor does not change qualitatively. In all cases the bargaining power has a significant impact. Therefore, the conclusion that mother's bargaining power has a negative impact on her child's labor is not a consequence of the particular variables chosen to estimate the bargaining power.

Table 10: Bargaining Power Parameters on Different Decisions

	Large Expenditures	**Large Appliances**	**Small Appliances**	**Electronics**
Sex Ratio	2.49 (0.53)***	1.85 (0.69)***	1.59 (0.72)**	1.78 (0.58)***
Observations	3759	4962	4862	5180
	Money to Husband's Parents	**Money to Wife's Parents**	**Husband's Job**	**Wife's Job**
Sex Ratio	1.38 (0.58)**	1.50 (0.51)***	1.15 (0.56)**	1.43 (0.60)**
Observations	3427	4634	3887	3343
	Husband's Clothes	**Wife's Clothes**	**Children's Health**	**Children's Education**
Sex Ratio	1.82 (0.55)***	1.23 (0.45)***	1.92 (1.14)**	3.11 (0.96)***
Observations	3701	5759	2593	2801
	House	**Car**	**Savings**	**Food Eaten at Home**
Sex Ratio	2.05 (0.64)***	0.18 (0.75)	0.38 (1.29)	1.20 (1.12)
Observations	4179	2174	827	2835

Note: Significantly different than zero at 99 (***) and 95(**)%. The coefficients correspond to the Sex Ratio coefficient on each equation estimated separately. The dependent variable is a dummy taking the value 1 if the wife participates in the decision.

Table 11: Comparing Bargaining Power Parameters across Different Decisions

	House	Large Appliances	Small Appliances	Electronics
Test	1.60	1.11	0.31	0.92
Probability	0.206	0.293	0.575	0.337
	Money to Husband's Parents	**Money to Wife's Parents**	**Husband's Job**	**Wife's Job**
Test	1.91	0.01	0.04	0.45
Probability	0.167	0.950	0.842	0.502
	Husband's Clothes	**Wife's Clothes**	**Children's Health**	**Children's Education**
Test	0.13	0.30	0.89	2.14
Probability	0.714	0.582	0.346	0.144

Note: Tests comparing each coefficient to the coefficient obtained using the decision about large expenditures. Probability is the probability of the null hypothesis that the coefficients are equal.

Table 12: Bargaining Power Parameters on a Child Labor Equation using Different Decisions in the Estimation of the Bargaining Power

	House	Electronics	Large Appliances	Small Appliances
Barg. Power	-18.39	-23.99	-26.82	-33.27
Std. Error	(8.11)**	(8.99)***	(9.74)**	(10.94)***
	Money to Husband's Parents	**Money to Wife's Parents**	**Husband's Job**	**Wife's Job**
Barg. Power	-22.15	-20.65	-24.68	-10.46
Std. Error	(9.60)**	(8.02)***	(10.86)**	(6.33)*
	Large Expenditures	**Husband's Clothes**	**Wife's Clothes**	
Barg. Power	-11.33	-11.75	-26.37	
Std. Error	(6.10)**	(6.68)*	(9.60)***	

Note: Significantly different than zero at 99 (***) and 95(**)%. Each coefficient corresponds to the effect of bargaining power on the hours of child labor. Bargaining power is estimated using one different decision variable each time.

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