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Leveling the Intra-household Playing Field

Compensation and Specialization in Child Labor Allocation

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Abstract

This paper analyzes changes in the allocation of child labor within the household in reaction to exogenous shocks created by a social program in Nicaragua. The paper shows that households that randomly received a conditional cash transfer compensated for some of the intra-household differences, as they reduced child labor more for older boys who used to work more and for boys who were further behind in school. The results also show that households that randomly received a productive investment grant, in addition to the basic conditional cash transfer benefits, both targeted at women, show an increased specialization of older girls in nonagricultural and domestic work, but no overall increase in girls' child labor. The findings suggest that time allocation and specialization patterns in child labor within the household are important factors to understand the impact of a social program.

This paper—a product of the Corporate Global and Methods team, Independent Evaluation Group—is part of a larger effort in the department to study the effects of social interventions on children's development outcomes. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The author may be contacted at xdelcarpio@worldbank.org.

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I. Introduction

Child labor in developing countries is a topic of debate and concern for many policy makers. The literature on child labor has discussed the complicated trade-offs that are often involved in parental decision-making on child labor, and has shed light on how various household characteristics and different contexts might affect such decisions (Basu, 1999; Edmonds, 2007). Less is known about child-specific characteristics parents take into account when assigning responsibilities for the various work tasks within the household. Parents' decisions could either reinforce existing differences between children by investing more in those children that have accumulated higher human capital or more natural or social endowments, or they could compensate for deficiencies through targeted investments. A positive shock might lead households to compensate for or reinforce existing differences. To the extent that such investments compete with, or possibly complement, children's time working, we would expect this to be reflected in the intra-household child labor allocations.

This paper therefore aims at analyzing how the allocation of tasks among children within a household changes in response to a social program. It first shows that child-specific characteristics can help shed light on the allocation tasks among children in a household. It then analyzes whether the exogenous shocks created by a social program resulted in compensation or reinforcement of pre-program differences in child labor allocation and human capital accumulation.

The program we analyze is called *Atencion a Crisis*, a conditional cash transfer program (CCT) in Nicaragua. Women in randomly selected treatment communities received a bi-monthly sizable cash transfer conditional on school enrollment and attendance of primary school children. A random subset of the beneficiaries in addition received a grant aimed at increasing their productive capacity in a nonagricultural activity. The empirical identification strategy in this paper relies on this two-staged randomized design to analyze the various factors that might affect child labor allocation.

To understand the intra-household allocations specifically, we use a household fixed effects model. This allows controlling for the many observed and unobserved household characteristics that might affect child labor.

In order to shed light on the intra-household child labor allocation, we consider not only the total amount of hours worked, but also the composition of labor by disaggregating work in hours by various non-domestic and domestic activities. Edmonds (2006) and Kruger and Berthelon (2007) have demonstrated that the inclusion of domestic work can be key to shed light on gender differences, as girls might be disproportionately assigned to domestic tasks. The differentiation between different tasks is also important as some tasks are more likely to compete with schooling in terms of timing, while parents could consider experience in other tasks as complementary to human capital investment through schooling. This could be the case because some child labor might result in learning new skills---such as counting and handling money in a small shop or engaging in commerce while selling goods in the community (Edmonds, 2007), or learning about agricultural practices which might increase future returns in agriculture (Beegle, Dehejia and Gatti, 2006).

Studies that analyze intra-household differences in child labor mainly focus on heterogeneity by birth order (Behrman and Taubman, 1986; Edmonds, 2006; Ejrnaes and Portner, 2004; Emerson and Souza, 2008; Manacorda, 2006).[1] Intra-household heterogeneity along other characteristics has received less attention. Yet, there is a large related literature on intra-household differences in investments in education, health and nutrition (Behrman, Pollack and Taubman, 1986; Das Gupta, 1987; Rosenzweig and Schultz, 1992; Foster, 1995). Differences in intra-household bargaining power between spouses often can lead to differences in resource spending between children of the same household (Thomas, 1997; Duflo, 2003). This can be reinforced by households coping mechanisms in the face of negative shocks. (Behrman, 1988; Behrman and Deolalikar 1988). Vice versa, a positive income shock can help to compensate for existing

[1] To our knowledge, other studies analyzing the impact of similar conditional cash transfer programs on child labor do not consider the intra-household re-allocation of child labor, though they do shed light on heterogeneity of child labor impacts along gender and age categories (see Skoufias and Parker, 2001 for evidence on Progresa/Oportunidades in Mexico, and Maluccio, 2003 for the *Red de Proteccion Social* in Nicaragua). Filmer and Schady (2008) show that a somewhat different conditional fellowship program targeted at individual children and involving much smaller cash transfers reduced child labor for eligible children, and did not affect work of ineligible siblings.

differences (Rose, 1999; Mansuri, 2006). Finally, Rangel (2008) provides striking evidence that expected return can affect parental decisions, as he finds that skin color helps explain differences in human capital investments between siblings in Brazil.

In this paper, we first consider whether the program helped to compensate for existing imbalances in child labor along gender lines. We then analyze whether the program helped parents to compensate for lags in academic achievement by reducing child labor more for children with lower past academic achievement. Both gender and past academic achievement are factors that parents are likely to take into account when considering the returns to schooling and the assignment of different child labor tasks within the household.

If parents decide on child labor allocations according to the expected returns, existing specialization patterns in society that require boys and girls to be prepared for different types of tasks might matter for child labor allocation. However, in the presence of a social intervention, the expected returns can change, potentially favoring children who would not be favored in regular circumstances. This is particularly the case given that CCTs give families direct transfers conditional on all primary-school-age children attending school. In addition, in households that received the productive investment package, women are likely to dedicate themselves more to nonagricultural economic tasks. This might increase returns to girls' labor in these nonagricultural activities, but also in domestic tasks to the extent they need to substitute for their mother's work.

Parents also may consider past academic achievement when considering returns to both specific child labor tasks and returns to further schooling, which can compete with child labor. Past academic achievement is likely to capture a combination of innate ability and accumulated skills, which might be the result of past disadvantages, negative shocks, and investment decisions that may have affected different children in the households differently.[2] It is *a priori* unclear whether the positive program income shock linked with the conditionalities would lead to compensation or reinforcement of existing differences. Parents may reduce child labor more for children without lags and exacerbate intra-household differences, or they could decrease child labor more for children with existing

[2] The dataset does not contain baseline test-scores for the vast majority of the children in the sample. We therefore rely on this proxy measure of past academic achievement to capture unobserved ability and accumulated skill.

lags, possibly helping to compensate for past delays. While academic achievement is a measure of both innate ability and accumulated skill, this question relates to the debate on parents human capital decisions as a response to innate abilities. Becker (1991) predicts that parents will invest more in the human capital of abler children, but, in the case of rich families, parents make compensatory transfers to less able children. Empirical results for the US are mixed, as some find that parents compensate for deficiencies in children's endowments or prejudices from cultural biases (Becker and Tomes 1976; Wilhelm, 1996; Ashenfelter and Rouse, 1998; Ermish and Francesconi, 2000), while other results suggest that investments by parents reinforce genetic endowment (whether intelligence or gender) and/or labor-market biases (Kim, 2005).

This paper first shows that child labor is distributed unequally within the household, and that there appear to be clear patterns of specialization. In particular, while total amount of hours worked do not differ significantly by gender, boys work more hours than girls in economic activities, and this difference comes primarily from work in agriculture. Girls work more in domestic activities and livestock. The trade-off between schooling and work appears to be stronger for boys, possibly due to the specialization in agriculture that competes, in terms of when the activity takes place, more directly with schooling. Intriguingly however, children that are attending school are more likely to work in nonagricultural activities than their siblings.

The paper then shows that the program helped compensate for some of these intra-household differences, but exacerbated others. In particular, it reduced total hours worked more for older boys, and for boys with low past academic achievements. Households that, in addition to the CCT, randomly received the productive investment grant show an increased specialization of older girls in nonagricultural and domestic work, but no overall increase in older girls' child labor.

The rest of the paper is organized as follows. Part II provides the necessary background on the program and its randomization. In part III we turn to the data, discuss the patterns in intra-household labor allocation, and derive hypotheses related to the program impact. In part IV we present the main results of the paper, and show how the program impacts differ between siblings with different gender and with differences in past academic achievements. Part V concludes.

II. Background on the Program

II.1. Program design

The *Atención a Crisis* program was a one-year pilot program implemented between November 2005 and December 2006 by the Ministry of the Family in Nicaragua.[3] The program was implemented in the aftermath of a severe drought and had two objectives. First, it aimed to serve as a short-run safety net by reducing the impact of the aggregate shock on human and physical capital investments. This was facilitated via cash transfers, which were envisioned to reduce the need for ex-post, adverse coping mechanisms, such as asset sales, taking children out of school or reductions in food consumption. Second, the program also intended to promote long run upward mobility and poverty reduction through asset creation by enhancing households' asset base and income diversification capacity. [4]

In order to achieve these objectives, and building on the already existing and successful conditional cash transfer model in Nicaragua (*Red de Protección Social - RPS*), the program introduced 3 different packages in order to evaluate and compare the effectiveness of each to reach the objectives stated above. Specifically, a total of 3,000 households were selected to participate in the program. These households were allocated one of three different packages through a participatory lottery, organized in each community: (i) the basic CCT; (ii) the basic CCT plus a scholarship for an occupational training; and (iii) the basic CCT plus a grant for productive investments.

All selected beneficiary households received the basic CCT consisting of cash transfers conditional on children's primary school and health service attendance. In addition to the CCT, one third of the beneficiary households also received a scholarship that allowed one of the household members to choose among a number of vocational training courses offered in the municipal headquarters. However, due to implementation delays, the vocational training courses had not started yet at the moment of the follow-up

[3] For an extensive description of the program and evaluation design see Macours and Vakis (2005, 2008).

[4] Macours and Vakis (2008) show that the program increased school enrollment and attendance, and that beneficiary households of the productive investment package had higher incomes from nonagricultural self-employment. Del Carpio (2008) shows that the program led to a shift of child labor to such nonagricultural activities, and an overall decline in total child labor hours.

survey. Finally, another third of the beneficiary households received, in addition to the basic CCT, a grant for productive investments aimed at encouraging recipients to start a small non-agricultural activity with the goal of asset creation and income diversification. This grant was conditional on the household developing a business development plan, outlining the investments outside of subsistence farming in new livestock or non-agricultural income generating activities. This package included technical assistance and training in basic commercial skills. The beneficiaries of the productive investment package had received the largest amount of benefits at the moment of the follow-up survey: 2-3 months before being surveyed they had received $175 to invest.[5]

II.2. Program randomization

The program was targeted to 6 municipalities of the drought region in the northwest of Nicaragua. These were municipalities that met both criteria of having been affected by a drought the previous year and by the high prevalence of extreme rural poverty based on the national poverty map. From the list of all communities in the 6 municipalities, 56 intervention and 50 control communities were randomly selected through a lottery to which the mayors of the 6 municipalities were invited to attend and participate. Baseline data were then used to define program eligibility based on poverty and vulnerability, resulting in the identification of 3,000 households to participate in the program.[6] Finally, from each eligible household, the female household member that was reported as the children's primary caregiver was invited to a registration assembly.[7] At the end of each assembly, all the beneficiaries participated in a lottery process through

[5] The remaining $25 was to be paid on the next payment day (after survey completion).

[6] The eligibility criteria were determined using the proxy means methodology developed for the RPS and based on the national household data from 2001 (EMNV). Additional discussions with local leaders from each intervention community were conducted to identify possible exclusion or inclusions errors. Based on this, the list of eligible households was finalized. Based on the discussions with leaders, 3.72% of all the households considered were re-assigned from non-eligible to eligible, and 3.65% from eligible to non-eligible. To avoid any possible selection bias resulting from the re-assignment by the leaders, all estimates in this paper are intent-to treat estimates, using the intent-to-treat as defined by the proxy means methodology.

[7] Only in the few cases that there was no adult female in the household, an adult man was selected as the program recipient.

which the three packages described above were randomly allocated among the eligible households.[8]

Table 1 presents the randomization results for the sample of eligible households with children between 6 and 15 years old.[9] The differences between households in treatment and control communities are small and not statistically significant. Similarly, the differences between households with the productive investment package and households in the control communities are generally small and not significant.

III. Data, Descriptive Patterns, and Hypotheses

III.1. Data

The data comes from a household panel in the control and treatment communities. In treatment communities, data were collected from all households. In control communities, a random sample of households was selected to obtain a control group of equal size as each of the three intervention groups (of about 1000 households). The follow-up data was collected 9 months after the start of the program. The attrition rate of the second round was 1.3 percent of the original households.[10] The attrition is uncorrelated with treatment.

The main household survey, collected in both rounds, contains household and individual level data on various socio-economic indicators on approximately 4400 households. In the follow-up survey, additional questions on child labor were added, to capture in particular children's work in chores (wood and water gathering) and domestic work. The quantitative data was complemented with qualitative work, based on focus groups and semi-structured interviews with a wide set of beneficiaries and other local actors in treatment and control communities (see Aguilera et al., 2006).

III.2. Child labor allocation patterns

[8] Participation by the invited beneficiaries to the assemblies and lotteries was near 100%.

[9] Take-up of the overall program among eligible households was 95%, with the main attrition due to exclusion by leaders (see footnote 6). Take-up of the productive investment grant among households in the program was near 100%.

[10] The low attrition rate was the result of tracking both households and individual household members that had moved since the baseline.

Before considering the program impact, we describe the child labor patterns in the control communities.[11] Child labor is measured in number of hours worked per week in economic activities, chores and domestic activities. Economic activities include labor in agricultural and livestock activities, as well as labor in nonagricultural activities.[12] Child labor in agricultural and livestock mostly consists of help with the crops or livestock self-employment activities of the household, but also includes wage labor in agriculture. Labor in nonagricultural activities consists of help by children in the commercial or manufacturing self-employment activities of the household, or possibly wage-employment outside of agriculture. Chores consist of wood or water gathering, and domestic activities include cooking, cleaning, washing and caring for younger siblings. Table 2 shows that including chores and domestic work is important as they constitute a large part of child labor.

Table 2 further shows very clear gender patterns in the allocation of child labor within the household.[13] Boys work more hours in economic activities, in particular agriculture, and also spend more time carrying water and wood. On the other hand, girls work more hours in domestic activities. As a result, there are no significant differences between girls and boys in total number of hours worked. The table shows that boys work on average almost 2.5 hours per week more than their sisters in economic activities. The difference between boys and girls falls to less than an hour, and is not significant, when chores and domestic activities are included. Overall, these patterns suggest within-household specialization along gender lines.[14]

Not surprisingly, the data also indicate that older children work more hours than younger children. Given that the age of the child and possibly gender might be correlated with other variables of interest (such as school attendance and grade achievement), we

[11] We use the control, instead of the baseline, for the descriptive statistics, as information on child labor in chores and domestic work was not collected in the baseline survey. For the other variables, descriptive patterns in the baseline are similar to those described for the control communities at follow-up.

[12] There is a small number of observations for which the total hours in economic activity is known, but it is unclear whether the hours were dedicated to nonagricultural or agricultural work. As a result, the coefficients of hours in nonagricultural activities, agriculture, and livestock in the tables do not add up exactly to the coefficient of hours in total economic activity.

[13] In order to look within the household, we regressed each of the child labor outcomes on a gender dummy and a household fixed effect.

[14] The intra-household patterns are consistent and somewhat stronger than the inter-household differences between boys and girls.

normalize the outcome variables by regressing each outcome on a series of dummies for age (in months) by gender for the control. For outcomes used in the fixed effect estimates, we also include household fixed effects in these estimations. We then obtain the residual by subtracting the estimated outcome for each category from the observed measure. In the rest of the paper we use these measures to analyze how child labor hours differ from the average number of hours of a child of the same gender and age.

Given the schooling conditionality, we analyze whether school attendance and child labor appear to compete for children's time. Table 3 shows that, after accounting for differences in age and gender, children who attend school indeed work on average 4 hours less per week. Children work in particular almost 3 hours less in agriculture, with the remaining hour mainly coming from chores and domestic work. Intriguingly however, school-going children work more in nonagricultural activities. None of these differences capture any household level variation, as the fixed effects control for household socio-economic status and other household unobservables. A possible explanation of the finding on nonagricultural activities is related to the low education levels of the parents whom might need the help of school going children for basic math and accounting necessary in such activities.[15]

Table 3 also shows results for boys and girls separately, and indicates that the negative correlation between child labor in economic activities and school attendance is completely driven by the results for boys. Girls work equal amounts in economic activities, whether they are attending school or not, but boys work on average almost 6 hours less when they attend school. This hence suggests that for boys, school and work might be substitutes, while this is much less the case for girls. This is consistent with the timing of work in agriculture—which occurs mainly in the mornings at the same time of classes—and with the specialization of girls and boys in different tasks.

Finally, table 4 shows that there are no significant differences in child labor allocation between children who are below grade level, and their siblings who are at grade level. The relationship between past academic achievement and child labor hence does not appear to be straightforward.

[15] The average education level of household heads is 2.7 years.

III.3. Hypotheses

Does the *Atencion a Crisis* program strengthen or offset existing child labor allocation patterns within the households? The answer likely depends on a number of program design features. First, the cash component of the program might reduce the need for child labor and might do so more for certain activities in which boys specialize. It is possible for instance, that the cash would be used to hire day laborers in agriculture that could substitute for the boys' work. Second, the school conditionality related to the program, together with the cash that allows buying school materials, might increase enrollment and attendance to school, and therefore reduce the number of hours the children can work. This might have a larger impact on those children that would have been working more in the absence of the program. The descriptive results hence would suggest that both the cash and the conditionality might affect work hours of older boys in particular, and as such possibly reduce the gender discrepancies.

On the other hand, the program was targeted to women, and women were the direct beneficiaries of the cash, which could possibly lead to a higher reduction of child labor for girls (Emerson and Portela Souza, 2007). Yet the program – and in particular the productive investment package – might also lead to an increased need for help in nonagricultural activities. These are activities in which older girls tend to specialize, and it is unclear whether the increased demand for labor would reinforce or weaken this specialization pattern. Households with the productive investment package possibly also have an increased need for help with domestic work. As the female beneficiary takes up her new activity, this could affect older girls in the household, and lead to a reinforcement of the age and gender patterns. Also, given low levels of literacy in the region, adult program participants might need to rely on children with more advanced math skills (higher schooling levels) for help with the accounting part of the new activity.

Finally, the finding that there are no significant differences in child labor between children who are at grade level versus those that are behind, might indicate that on average parents do not put extra labor burden on children that have fallen behind in school. This could be because higher ability or accumulated skill can increase both the return to child labor and the return to schooling, or because higher ability or accumulated skill can make it easier for children to combine both. If this is the case, one might expect

that the additional cash combined with the conditionalities might help parents to compensate for past lags in academic achievement.

IV. Impact of *Atencion a Crisis* on Intra-household Child Labor Allocation

Given that the decision-making in households with the productive investment package needs to account for a number of additional factors, we analyze both the impact on the intra-household allocation of all households from the treatment communities, and the impacts of households with the third package specifically. We rely on the randomized design, and estimate the impacts using simple differences between the treatment and control households. Hence let

$$Y_{ij} = \beta \ + \beta T_i + \beta \ X_{ij} + \beta \ T_i X_{ij} + \eta_i + \varepsilon_{ij}$$

where Y_{ij} is the child labor hours (in a specific type of activity) for child j in household i corrected for any gender-specific age-trends based on the estimated trends for the control group. T is a dummy variable indicating the intent-to-treat for household i, X_{ij} a key characteristic of child j in household i that could affect child labor allocation (gender or past academic achievement), η_i captures all unobservable characteristics of household i, while ε_{ij} captures the unobservable characteristics of child j in household i.

We estimate the model using household fixed effects, implying that both the term βT_i and η_i cancel out. The estimate of β , the coefficient of interaction of the intent-to-treat dummy with the various variables of interest then shed light on the intra-household reallocation in child labor. The model hence allows isolating the heterogeneity in impacts within households along a number of dimensions, while controlling for all unobservable household factors. We first consider differences between children of different gender, and then focus on whether past academic achievement of the child is related to differences in program impact within the household.

As the βT_i term cancels out when we include household fixed effects, we also estimate a random effects model in order to facilitate the interpretation of the estimate for β . All standard errors are corrected for clustering at the community level.

IV.1. Gender: compensation and specialization

Table 5 sheds light on the reallocation of child labor within the household as a result of the intervention. The top panel shows that child labor decreases more for boys than for girls, and this is primarily the result of larger decreases for boys in agriculture and livestock activities. Both child labor in all economic activities and total child labor reduce more for boys than for girls, leading to a reduction of the gaps in total numbers worked with 1.5 hours.

When accounting for heterogeneity by age when considering gender differences in impact, it becomes clear that the reductions in agriculture, livestock, domestic work and total work are particularly large for older boys, when compared to their siblings. In contrast, impact on child labor allocation for older girls does not seem to be bigger than for their younger sisters, and there is some indication of an increase in domestic work, relative to their younger sisters.[16] Yet, in terms of total hours worked the impact for girls does not increase or decrease significantly as age increases, which contrasts the results found for boys.

Table 6 shows that the finding that child labor decreases more for boys than for girls is robust to different alternative specifications, including 1) controlling for age and gender trends in the regression instead of measuring the dependent variable as a deviation from the age-gender specific mean; and 2) including only households that have some child labor. The latter robustness check addresses a potential truncation concern. Note first that because the dependent variable is measured as deviations from the mean for children of the same age and gender in the control, there is no clear truncation in this variable. Nevertheless, there might be a concern related to truncation at 0 of the original child labor variables. Specification 2 excludes all the households where no children were working, to shed some light on this issue. As can be seen there are actually relatively few households (about 68 out of 1594) where none of the children work, and results are quite similar than the estimates on the full sample. As another robustness check, we have estimated the random effects model using tobit and without first demeaning the

[16] The estimates in the random effects model (lower panel) suggest that the program reduced domestic work for young girls, but increased the number of hours dedicated to domestic work for older girls. This does not however translate in a significant overall increase of work for them. On the other hand, the point estimates in the first column shows that the number of hours in nonagricultural work increased for both boys and girls.

dependent variable (with bootstrapped standard errors to correct for clustering at the community level), which shows significant effects that are quite similar in magnitude to those from the OLS model: the gender difference in impact in all economic activity is -1.9 and in overall work -1.4 compared to -1.8 and -1.5 respectively in the OLS random effects model.[17]

In a third robustness check we compare only households with the basic CCT package with the control. While the standard errors in the later regression are higher because of smaller sample sizes, the point estimates are similar. Overall, all three alternative fixed effects specification show that child labor decreased substantially more for boys than for their female siblings, with the additional reduction in total work about 1.5 hours.

Table 7 re-estimates the model only including households with the productive investment package and control households. Given that the productive investment grant might have increased the return to activities in which women specialize, one can wonder whether this package led to a shift of girls' child labor to those activities. The results first show that for this group, child labor for boys decreases significantly more than for girls, which appears to be driven by labor in agriculture and livestock. The results also show that the productive investment package result in a shift of older girls to nonagricultural activities and domestic activities, when compared with their siblings. As a result of both these mechanisms, the gender differences are somewhat larger than for the basic package. The productive investment package hence appears to reinforce intra-household specialization of older girls in nonagricultural activities and domestic work, and shifts their labor away from chores. Note that the random effects estimation indicates that the overall impact on child labor of older girls is not significant - in fact the sum of the coefficients is close to 0 (-1.6 + 1.7). These results suggest that while the productive package led to less child labor for younger girls and older boys, it did not significantly affect overall child labor of younger boys and older girls.

Overall then, these results suggest that the conditional cash transfer helped to narrow intra-household gender and age differences in child labor, and older boys in

[17] We cannot estimate the fixed effects model with tobit as it would lead to inconsistent coefficient estimates.

particular appear to have benefited most.[18] This is consistent with the descriptive statistics in table 3 that suggested that school attendance and boys' work in agriculture are negatively correlated with each other. This could indicate that the school conditionality, by guaranteeing that children are in school at the moment they otherwise would be working in the field is helping compensate for the higher number of hours that older boys were working, when compared to their sisters, and their younger siblings. At the same time, there is evidence of increased intra-household specialization of older girls in nonagricultural activities and domestic work for households who received the productive investment package.

IV.2 Past academic achievement

We now consider whether the program helped compensate for lags in past academic achievement, and in particular whether reductions in child labor are larger for children that were lagging behind. The variables we use to measure past academic achievement are a dummy variable indicating whether the child was below the grade level that corresponds to its age at baseline, and a variable indicating the number of years the child was below grade level at baseline. These variables are likely to capture innate capabilities, academic skills (or lack thereof), and past disadvantages that might have led the children to have lower academic performance than their siblings. For example, a child might have been disadvantaged because of a drought shock in early childhood that affected his or her cognitive development during a critical stage (see e.g. Alderman, Hoddinott and Kinsey, 2006). Such disadvantage might afterwards have been aggravated (or not) by resource allocation decisions of the parents. Or children with lower cognitive abilities might themselves have been more likely to drop out of school, and therefore might have higher child labor participation. On the other hand, parents of children with very low abilities might not make them work, as the returns to their work might be very low.

[18] These findings resonate with findings from the randomized evaluation of the Mexican *Progresa (Oportunidades)* program, as Skoufias and Parker, 2001 show significant reductions in labor participation for boys and significant decreases on leisure time for girls. Findings of another CCT program in Nicaraguan (*Red de Proteccion Social)* show larger reductions of child labor for older children (Maluccio, 2003).

Independently of the reasons why certain children in a household are below grade level, it is interesting to see whether parents shifted child labor away from those children and as such might help compensate for lags. Table 8 shows the fixed effect estimation that accounts for heterogeneity of impacts by past academic achievement and gender.[19] The results show that boys that were below grade level had a much larger reduction in child labor in economic activities, in particular in agriculture when compared to their brothers; labor for boys that are at least 1 grade behind reduced with 3 hours per week more than labor for other boys.[20] Interestingly however, these boys seem to be shifted into domestic work, as compared to their brothers, and as a result the effect is much smaller, when considering all hours worked.[21] When considering the nonagricultural work, there is some indication that the increase in child labor in this activity is muted for children of both genders who are behind grade level. This is consistent with patterns of specialization in nonagricultural activities by children with higher schooling levels, as shown earlier in the paper. Other than that, we do not find any significant differences in child labor impacts between girls with low versus high past academic achievement.

Overall, the results in past academic achievement hence indicate that the program did help compensate for past lags, but only for boys. Parents responded to the program by reallocating boys with lower skill or ability away from agriculture, but other boys had larger reductions in domestic work.

V. Conclusions

This paper has analyzed whether parental decisions in response to a social program in rural Nicaragua appear to compensate or reinforce pre-program differences in child labor allocation and human capital. The paper shows that the program helped

[19] The estimates are robust to inclusion of additional interaction effects of the dummy for older children with the gender specific ITT effect, indicating that our proxy for past academic achievement is not just capturing an age effect.

[20] This resonates with findings from Edmonds and Schady (2008) from an unconditional cash transfer program in Ecuador, showing reduction of child labor for children vulnerable to transitioning from school to work, but not for others.

[21] The relative reduction of child labor in economic activity among boys below grade level is even larger when considering only households with the productive investment grant. Labor in agriculture, and as a result in total economic activity reduces by almost 4 hours, as compared with their brothers at grade level. As for the full sample this effect is partially offset by an increase in hours spent in domestic work (results available from the authors).

compensate for some of these intra-household differences, but exacerbated others. In particular, it reduced total hours worked for older boys, and for boys with low past academic achievements, and these results are driven by reductions in agriculture and livestock. On the other hand, the productive investment package reinforced existing specialization in specific tasks within the household for older girls in particular. Girls in households that received the productive investment package are more likely to increase work in nonagricultural activities and domestic work, when compared to their siblings. This suggests that increased potential for nonagricultural activities in the household reinforced specialization by girls in these tasks. At the same, overall child labor did not increase for these older girls, suggesting that combining the productive investment package with the conditional cash transfer might have been important to avoid an overall increase of child labor of girls.

A possible explanation of these differences in impacts by gender relates to the timing of the different activities. Agricultural work tends to be done in the mornings, at the same time of classes, while nonagricultural work, domestic work, and chores can be done at a time that does not directly compete with class. Moreover, boys' work in agriculture can be substituted for with paid labor, while this is more difficult for the tasks in which the girls specialize. The program increased the likelihood of using wage labor in agriculture with about 20 % (P-value = 0.024), indicating that such substitution indeed might have taken place. On the other hand, the new nonagricultural activities were typically small scale and did not involve any wage labor.

Given that boys--older boys and boys that had fallen behind in school--before the program worked more hours in economic activities compared to their siblings these findings suggest that the program helped level the playing field to a certain extent. While the paper cannot identify whether it is the cash or the conditionality feature of the program design that helped trigger this response, it is consistent with substitution between child work in agriculture and schooling, and with the program impacts on school enrollment and attendance (see Macours and Vakis, 2008). On the other hand, for both genders, child labor in nonagricultural economic activities and schooling appear to be complements, even within the household, possibly indicating that the return to children's schooling is higher for such activities, possibly because of low education levels of the

adults. Overall, the findings in this paper suggest that time allocation and specialization patterns in child labor within the household are important factors to understand the impact of a program, such as *Atencion a Crisis*, on child labor.

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Table 1: Randomization results

Household Characteristics	# Obs.	Control (C)	Treatment (T)	productive investment package (T3)	P-value (T-C)	P-value (T3-C)
Age household head	1596	43.65	43.59	44.28	(0.94)	(0.50)
Male household head	1597	0.850	0.859	0.875	(0.71)	(0.37)
Literate household head	1597	0.618	0.652	0.654	(0.28)	(0.36)
# years education household head	1496	2.734	2.721	2.785	(0.94)	(0.80)
Household size	1597	6.882	6.918	7.041	(0.83)	(0.41)
Number of hh. members under 5	1597	0.804	0.766	0.778	(0.60)	(0.74)
Number of hh. members 5-14	1597	2.824	2.919	2.934	(0.16)	(0.19)
Number of hh. members 15-24	1597	1.060	1.050	1.081	(0.89)	(0.82)
Number of hh. members 25-64	1597	2.039	2.050	2.067	(0.81)	(0.63)
Number of hh. members 65 or older	1597	0.143	0.119	0.148	(0.37)	(0.87)
Number of rooms in the house	1597	1.652	1.601	1.626	(0.61)	(0.81)
Own land	1597	0.681	0.656	0.667	(0.56)	(0.76)
Distance to school (min)	1597	0.327	0.261	0.262	(0.10)	(0.11)
Distance to health center(min)	1597	1.216	1.156	1.146	(0.70)	(0.66)
Distance to municipal headquarters	1597	1.693	1.578	1.623	(0.53)	(0.72)
At least one household member active in:						
Self-employment in agriculture	1597	0.911	0.880	0.901	(0.26)	(0.73)
Self-employment in livestock	1597	0.536	0.474	0.488	(0.36)	(0.52)
Wage labor in agriculture	1597	0.592	0.651	0.697	(0.19)	(0.04)
Elaboration food products	1597	0.060	0.075	0.079	(0.50)	(0.45)
Manufacturing (self-employment)	1597	0.036	0.029	0.036	(0.67)	(0.97)
Commercial activities	1597	0.082	0.080	0.066	(0.91)	(0.38)
Services (self-employment)	1597	0.053	0.049	0.056	(0.80)	(0.89)
Wage employment	1597	0.174	0.191	0.191	(0.58)	(0.59)
Skilled wage employment	1597	0.036	0.047	0.056	(0.43)	(0.20)
Total consumption per capita (cordoba)	1584	4039	4248	4255	(0.42)	(0.47)
Total income per capita (cordoba)	1584	3278	3602	3611	(0.13)	(0.23)
Income from agricultural wage labor	1589	2150	1959	2024	(0.49)	(0.67)
income for elaboration food products	1590	115.9	120.5	124.4	(0.92)	(0.88)
income from commercial activities	1589	175.4	205.7	154.6	(0.62)	(0.76)
income from manufacturing (self-employment)	1589	26.97	21.5	30.0	(0.73)	(0.86)
Income from services (self-employment)	1590	155.7	125.0	105.0	(0.63)	(0.43)
Income from nonagricultural wage labor	1578	681.3	975.6	904.2	(0.12)	(0.34)
Income from temporary migration	1592	2663	2838	2432	(0.69)	(0.62)
Monetary income from agricultural self-employment	1591	728.5	829.5	865.4	(0.50)	(0.41)
Monetary income from livestock	1591	737.1	651.2	558.1	(0.49)	(0.20)

NOTE: P-value account for clustering at community level. All values refer to intent-to-treat

Table 2: child labor by gender : intrahousehold allocation

	Number of hours per week child between 6 and 15 years worked in :							
	non-agricultural	agriculture& livestock	agriculture	livestock	chores	domestic work	all econ activity	all work
Boy	0.1725	4.225	3.264	0.929	4.559	1.444	4.488	10.489
Girl	0.261	1.698	0.497	1.166	3.622	3.936	2.049	9.606
Difference	-0.0885	2.527	2.767	-0.237	0.937	-2.492	2.439	0.883
P-value	0.280	0.000	0.000	0.045	0.000	0.000	0.000	0.190

NOTE: Control communities only. Results from estimations with household fixed effects. Standard errors corrected for clustering at community level. Children 6-15 years old, in households with at least 2 children in this age range. N = 1088 (from 413 households)

Table 3: difference in child labor between children assisting to school and those not assisting: intrahousehold allocation

	Number of hours per week child between 6 and 15 years worked in :							
	non-agricultural	agriculture& livestock	agriculture	livestock	chores	domestic work	all econ activity	all work
ALL								
Difference	0.195	-2.962	-2.892	-0.0524	-0.469	-0.502	-2.759	-3.730
P-value	(0.083)	(0.006)	(0.008)	(0.720)	(0.170)	(0.140)	(0.013)	(0.000)
BOYS								
Difference	0.208	-5.971	-5.825	-0.110	-0.318	0.453	-5.744	-5.610
P-value	(0.17)	(0.002)	(0.002)	(0.55)	(0.54)	(0.14)	(0.003)	(0.002)
GIRLS								
Difference	0.185	-0.566	-0.558	-0.00659	-0.588	-1.263	-0.383	-2.234
P-value	(0.22)	(0.35)	(0.35)	(0.98)	(0.090)	(0.009)	(0.53)	(0.000)

NOTE: Controlling for gender and age through series of age dummies by gender. Control communities only. Results from estimations with household fixed effects. Standard errors corrected for clustering at community level. Children 6-15 years old, in households with at least 2 children in this age range. N = 1088 (from 413 households)

Table 4: difference in child labor of children below their optimal grade level versus others: intrahousehold allocation

	Number of hours per week child between 6 and 15 years worked in :							
	non-agricultural	agriculture& livestock	agriculture	livestock	chores	domestic work	all econ activity	all work
ALL								
Difference	0.0139	0.220	0.312	-0.101	0.00293	-0.0512	0.210	0.162
P-value	(0.90)	(0.71)	(0.60)	(0.39)	(0.99)	(0.80)	(0.74)	(0.83)
BOYS								
Difference	0.108	0.272	0.309	-0.0382	-0.245	-0.344	0.391	-0.199
P-value	(0.51)	(0.78)	(0.76)	(0.80)	(0.48)	(0.21)	(0.70)	(0.87)
GIRLS								
Difference	-0.0820	0.143	0.295	-0.168	0.231	0.220	-0.00201	0.449
P-value	(0.47)	(0.81)	(0.59)	(0.35)	(0.56)	(0.48)	(1.00)	(0.60)

NOTE: Controlling for gender and age through series of age dummies by gender. Control communities only. Results from estimations with household fixed effects. Standard errors corrected for clustering at community level. Children 6-15 years old, in households with at least 2 children in this age range. N = 980

Table 5: Intrahousehold heterogeneity of impacts by gender and age: all eligible households

Fixed Effects Model

		Number of hours per week child between 6 and 15 years worked in :							
COEFFICIENT	nr obs/hh	non-agricultural	agriculture & livestock	agriculture	livestock	chores	domestic work	all econ activity	all work
male*itt	4253/1594	-0.00231	-1.179**	-0.824*	-0.374**	-0.0395	-0.223	-1.256**	-1.518**
		(0.11)	(0.47)	(0.45)	(0.17)	(0.25)	(0.27)	(0.49)	(0.63)
female*age1015*itt	4253/1594	0.209	0.575	0.264	0.311	-0.180	0.663*	0.707	1.191
		(0.182)	(0.488)	(0.447)	(0.197)	(0.302)	(0.350)	(0.511)	(0.723)
male*age1015*itt		-0.0281	-2.786***	-2.014***	-0.805***	-0.154	-0.0823	-2.840***	-3.076***
		(0.133)	(0.784)	(0.725)	(0.215)	(0.330)	(0.234)	(0.794)	(0.906)
male*itt		0.137	0.743	0.476	0.267	-0.0584	0.217	0.775	0.933
		(0.132)	(0.542)	(0.498)	(0.226)	(0.380)	(0.364)	(0.591)	(0.883)
P-value female*age1015*itt = male*age1015*itt		0.586	0.001	0.015	0.000	0.909	0.088	0.001	0.000

Random Effects Model

		Number of hours per week child between 6 and 15 years worked in :							
COEFFICIENT	nr obs/hh	non-agricultural	agriculture & livestock	agriculture	livestock	chores	domestic work	all econ activity	all work
male*itt	4253/1594	-0.0580	-1.741***	-1.296***	-0.413***	0.229	-0.142	-1.755***	-1.478**
		(0.11)	(0.48)	(0.46)	(0.15)	(0.22)	(0.24)	(0.52)	(0.61)
itt		0.192**	-0.104	-0.288**	0.177	-0.707**	0.0735	0.00238	-0.747
		(0.090)	(0.23)	(0.12)	(0.19)	(0.35)	(0.25)	(0.26)	(0.63)
female*age1015*itt	4253/1594	0.181	-0.0594	-0.0295	0.0467	-0.255	0.810**	0.0364	0.805
		(0.151)	(0.291)	(0.221)	(0.201)	(0.285)	(0.329)	(0.344)	(0.614)
male*age1015*itt		0.0502	-3.405***	-2.851***	-0.672***	-0.0134	0.163	-3.199***	-3.011***
		(0.114)	(0.817)	(0.782)	(0.184)	(0.336)	(0.194)	(0.824)	(0.914)
female*itt		0.0864**	-0.0664	-0.269***	0.151	-0.558*	-0.399*	-0.0165	-1.208**
		(0.0434)	(0.201)	(0.103)	(0.166)	(0.321)	(0.213)	(0.219)	(0.543)
male*itt		0.106***	0.117	0.0591	0.153	-0.471	-0.161	0.0917	-0.489
		(0.0384)	(0.255)	(0.183)	(0.144)	(0.305)	(0.176)	(0.314)	(0.494)
		0.529	0.000234	0.00199	0.00407	0.253	0.204	0.000384	0.00115
P-value female*age1015*itt = male*age1015*itt		0.529	0.000	0.002	0.004	0.253	0.204	0.000	0.001

NOTE: Standard errors corrected for clustering at community level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Dependent variables corrected for gender-specific age trends by regression of outcomes in control and on series of age dummies for each gender. All estimates include a gender dummy, and interactions for gender and age. All households with at least 2 children between 6 and 15. age1015 is a dummy variable = 1 for children between 10 and 15. Fixed effects model controls for household fixed effects, random effects model controls for household random effects.

Table 6: Robustness test for intrahousehold heterogeneity of impacts by gender: all eligible households:

Fixed Effects Models

		Number of hours per week child between 6 and 15 years worked in :							
COEFFICIENT	nr obs/hh	non-agricultural	agriculture & livestock	agriculture	livestock	chores	domestic work	all econ activity	all work
1. Without removing age trends and with age*gender dummies as control									
male*itt	4253/1594	-0.0452	-1.060*	-0.863	-0.215	-0.102	-0.361	-1.063*	-1.527**
		(0.123)	(0.553)	(0.549)	(0.169)	(0.232)	(0.303)	(0.564)	(0.722)
2. Only households with some child labor									
male*itt	4098/1528	0.00914	-1.068**	-0.743	-0.345**	-0.0312	-0.318	-1.135**	-1.483**
		(0.116)	(0.477)	(0.454)	(0.173)	(0.254)	(0.271)	(0.491)	(0.643)
3. Only households with T1 compared to control									
male*itt	2102/798	-0.0495	-0.987	-0.744	-0.294	0.0316	-0.414	-1.110*	-1.492**
		(0.140)	(0.601)	(0.583)	(0.255)	(0.324)	(0.353)	(0.574)	(0.739)

NOTE: Standard errors corrected for clustering at community level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Dependent variables in 2nd and 3rd specification corrected for gender-specific age trends by regression of outcomes in control and on series of age dummies for each gender. All estimates include a gender dummy, and interactions for gender and age, and a household fixed effect. All households with at least 2 children between 6 and 15. age1015 is a dummy variable = 1 for children between 10 and 15.

Table 7: Intrahousehold heterogeneity of impacts by gender and age: Beneficiaries from productive investment package versus control

Fixed Effects Model

		Number of hours per week child between 6 and 15 years worked in :							
COEFFICIENT	nr obs/hh	non-agricultural	agriculture & livestock	agriculture	livestock	chores	domestic work	all econ activity	all work
male*itt	2143/806	-0.0680	-1.480**	-0.914	-0.558**	0.0654	-0.0643	-1.760**	-1.759*
		(0.23)	(0.62)	(0.58)	(0.23)	(0.35)	(0.33)	(0.67)	(0.93)
female*age1015*itt	2143/806	0.915***	0.665	0.0801	0.561*	-0.245	0.946**	1.527**	2.228**
		(0.307)	(0.640)	(0.585)	(0.299)	(0.397)	(0.431)	(0.725)	(1.047)
male*age1015*itt		0.0499	-3.319***	-2.404***	-0.910***	-0.390	-0.0754	-3.254***	-3.720***
		(0.197)	(0.875)	(0.807)	(0.306)	(0.461)	(0.324)	(0.897)	(1.096)
male*itt		0.430*	0.853	0.545	0.300	0.154	0.525	1.031	1.710
		(0.247)	(0.682)	(0.647)	(0.286)	(0.485)	(0.450)	(0.782)	(1.126)
P-value female*age1015*itt = male*age1015*itt		0.184	0.002	0.031	0.001	0.984	0.177	0.000	0.001

Random Effects Model

		Number of hours per week child between 6 and 15 years worked in :							
COEFFICIENT	nr obs/hh	non-agricultural	agriculture & livestock	agriculture	livestock	chores	domestic work	all econ activity	all work
male*itt	2143/806	-0.205	-1.586***	-1.169**	-0.413**	0.482	0.0997	-1.806***	-1.186
		(0.19)	(0.54)	(0.52)	(0.19)	(0.30)	(0.29)	(0.59)	(0.77)
itt		0.621***	-0.0413	-0.292**	0.265	-0.963***	-0.143	0.539	-0.595
		(0.15)	(0.26)	(0.15)	(0.23)	(0.37)	(0.27)	(0.34)	(0.67)
female*age1015*itt	2143/806	0.895***	0.0848	-0.124	0.271	-0.402	1.026***	0.982**	1.748**
		(0.236)	(0.362)	(0.284)	(0.276)	(0.355)	(0.396)	(0.445)	(0.794)
male*age1015*itt		0.314**	-3.699***	-2.779***	-0.928***	-0.335	0.163	-3.266***	-3.503***
		(0.153)	(0.867)	(0.847)	(0.269)	(0.449)	(0.254)	(0.886)	(1.068)
female*itt		0.0920	-0.0959	-0.222	0.103	-0.728**	-0.746***	-0.0460	-1.631**
		(0.0860)	(0.273)	(0.148)	(0.238)	(0.350)	(0.235)	(0.330)	(0.669)
male*itt		0.233***	0.515	0.147	0.389	-0.283	-0.144	0.622	0.241
		(0.0805)	(0.363)	(0.272)	(0.243)	(0.366)	(0.203)	(0.435)	(0.664)
P-value female*age1015*itt = male*age1015*itt		0.049	0.001	0.007	0.017	0.884	0.015	0.000	0.000

NOTE: Standard errors corrected for clustering at community level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Dependent variables corrected for gender-specific age trends by regression of outcomes in control and on series of age dummies for each gender. All estimates include a gender dummy, and interactions for gender and age. All households with at least 2 children between 6 and 15. age1015 is a dummy variable = 1 for children between 10 and 15. Fixed effects model controls for household fixed effects, random effects model controls for household random effects.

Table 8: Intrahousehold heterogeneity of impacts by past academic achievement : all elegible households

Fixed Effects Model

		Number of hours per week child between 6 and 15 years worked in :							
COEFFICIENT	nr obs/hh	non-agricultural	agriculture & livestock	agriculture	livestock	chores	domestic work	all econ activity	all work
male*at least 1 grade behind	3228/1551	0.108	0.272	0.309	-0.0382	-0.245	-0.344	0.391	-0.199
		(0.16)	(0.96)	(0.99)	(0.15)	(0.34)	(0.27)	(1.01)	(1.21)
male*at least 1 grade behind*itt		-0.332	-2.734**	-2.560**	-0.132	0.683	0.966***	-3.087**	-1.438
		(0.21)	(1.21)	(1.22)	(0.29)	(0.44)	(0.34)	(1.27)	(1.43)
female*at least 1 grade behind		-0.0820	0.143	0.295	-0.168	0.231	0.220	-0.00201	0.449
		(0.11)	(0.58)	(0.54)	(0.18)	(0.39)	(0.31)	(0.61)	(0.85)
female*at least 1 grade behind*itt		-0.232	0.682	0.374	0.328	-0.194	-0.269	0.310	-0.153
		(0.22)	(0.73)	(0.64)	(0.27)	(0.45)	(0.43)	(0.74)	(1.04)
male*itt		-0.158	0.0639	0.401	-0.354	-0.707	-1.452***	-0.266	-2.425**
		(0.23)	(0.67)	(0.71)	(0.26)	(0.49)	(0.50)	(0.73)	(1.11)
P-value female*grbehind*itt = male*grbehind*itt		0.745	0.012	0.032	0.232	0.181	0.033	0.016	0.465
male*number grades behind	3192/1543	0.0151	0.218	0.184	0.0174	-0.0145	-0.181**	0.251	0.0555
		(0.043)	(0.45)	(0.47)	(0.055)	(0.13)	(0.076)	(0.45)	(0.49)
male*number grades behind*itt		-0.116*	-1.242**	-1.081**	-0.127	0.120	0.344***	-1.429***	-0.966*
		(0.058)	(0.50)	(0.51)	(0.095)	(0.15)	(0.10)	(0.50)	(0.54)
female*number grades behind		-0.00916	0.105	0.0908	0.0211	0.0909	0.0208	0.110	0.222
		(0.045)	(0.17)	(0.14)	(0.084)	(0.10)	(0.14)	(0.18)	(0.28)
female*number grades behind*itt		-0.123*	-0.0632	-0.0531	-0.0234	-0.0392	-0.0648	-0.287	-0.391
		(0.068)	(0.24)	(0.19)	(0.12)	(0.13)	(0.18)	(0.26)	(0.36)
male*itt		-0.200	0.514	0.778	-0.355	-0.464	-1.536***	0.190	-1.810
		(0.23)	(0.84)	(0.84)	(0.25)	(0.43)	(0.53)	(0.92)	(1.24)
P-value female*grbehind*itt = male*grbehind*itt		0.941	0.022	0.042	0.441	0.404	0.043	0.033	0.363

NOTE: Standard errors corrected for clustering at community level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Dependent variables corrected for gender-specific age trends by regression of outcomes in control on series of age dummies for each gender using a household fixed effects model. All estimates include gender dummy and household level fixed effects. All households with at least 2 children between 6 and 15. Academic achievement measured at baseline. age1015 is a dummy variable = 1 for children between 10 and 15.