

THE EFFECTS OF INCOME SHOCKS ON CHILD LABOR AND CONDITIONAL CASH
TRANSFER PROGRAMS AS AN INSURANCE MECHANISM FOR SCHOOLING

BY

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Abstract

This paper investigates the effects of adverse income shocks on household decisions concerning school attendance and child labor in rural Colombia and whether a conditional cash transfer program (CCT), Familias en Accion (FA), protects children's human capital investments of beneficiary households. If households are not totally insured, and credit markets are incomplete, we might expect changes in children's labor supply as a response to adverse shocks where labor markets exist. Using a three-year panel of beneficiary and control households and controlling for potential program endogeneity, we find that crop or job loss and illness shocks significantly increase child labor and access to credit helps reduce the adverse effect of these shocks. Additionally, the results suggest that FA consistently reduces the number of hours of child labor and increases the number of study hours, but not school enrollment, for households under shocks. In addition, we find that the program provides strong incentives for children to combine work and school when households are exposed to shocks. These results reveal that CCT programs can work as insurance for the schooling of the poor but are not able to completely displace costly risk-coping strategies.

Chapter 1 THE EFFECTS OF INCOME SHOCKS ON CHILD LABOR AS AN INSURANCE MECHANISM FOR SCHOOLING

1. Introduction

This work relates to important literature on consumption smoothing, credit constraints, and the role of public interventions on a country's safety net. Poor people in developing countries are highly exposed to idiosyncratic shocks that cause loss of income or unexpected expenditures of the household. However, it has been extensively documented (Morduch, 1994, and others) that poor households succeed in smoothing their consumption profiles, even with limited access to credit; hence they are likely to resort to mechanisms other than borrowing to cope with income shocks. This paper examines one such mechanism, child labor. If households use child labor to cope with shocks, the costs of uninsured shocks can be quite high in terms of human capital accumulation and poverty. Therefore, public interventions that alleviate the need for households to use their children as risk-coping instruments might play an important role on the safety net of the uninsured (de Janvry, Finan, Sadoulet, & Vakis, 2006).

Conditional cash transfer programs (CCTs) have been proven to be effective in increasing educational achievements and reducing child labor (Attanasio, Fitzsimons, Gomez, Lopez, Meghir, & Santiago, 2006; Schultz, 2004). A growing body of evidence has also shown that CCTs can play an important safety net role, protecting household consumption during an income shock and helping to mitigate the negative effects of a shock on children's human capital investments (de Janvry, Finan, Sadoulet, & Vakis 2006; Maluccio 2005 and others). In a previous chapter of this dissertation, we found that

consumption smoothing of poor households in Colombia is relatively high¹, and that households are adopting a variety of self-insurance strategies to spread the effects of income shocks over time. We also found that the CCT program Familias en Accion (FA) might be crowding out some self-insurance instruments, such as internal transfers, while reinforcing the use of savings. Using declared households' responses, we found no evidence of increasing household labor supply to buffer income shocks. In this paper, we go further, testing whether child labor is used as a risk-coping instrument and whether FA can crowd out this specific behavior, resulting in increased welfare of those involved.

Particularly, this paper investigates the effects of adverse shocks on household decisions concerning school attendance and child labor in rural Colombia and whether FA protects children's school enrollment of households under risk. Based on theoretical foundations (Jacoby & Skoufias, 1997), we expect that households would underinvest in the human capital of their children under imperfect credit markets and exposure to shocks. Also, we might expect CCT programs to protect child human capital from being used as a risk-coping instrument. If the effect of the condition on school attendance, acting as a price effect, is much larger than the income effect of the shock, then CCTs can be an efficient way of providing risk coping while protecting children's education. Therefore, the effect of shocks, access to credit, and CCTs on child labor and schooling decisions is ambiguous. This is what we address in this paper.

The empirical models in this study estimate equations for children's time at school and at work and for participation in school full time, work full time, and combined school and work. For this we use the FA evaluation survey, which includes longitudinal

¹ We found that poor households are able to insure at least 80% of food consumption when they face adverse income shocks.

detailed data on children's time use and adverse shocks along with individual, household, and community characteristics for beneficiary and control households of the program. Because FA was not randomly assigned among communities², we use difference-in-difference (DiD) matching methods to control for endogeneity on program participation and unobservable time invariant effects.

In this paper new ground is explored by explicitly incorporating the interactive effects of shocks, credit access, and CCT treatment on school and child labor hours. Previous studies have limited their analysis to estimate the effect of shocks and the mitigating effect of CCT only on schooling or child labor (de Janvry et al. 2006; Maluccio 2005 and others), not considering that children can work and study simultaneously. Given the condition on school attendance together with the fact that time at school and at work are not perfect substitutes, more relevant effects should be found on children that perform both activities. Knowing how hours on each activity are affected by shocks and how the program mitigates these effects is very important to understand the overall well-being of children.

The results of this research suggest that (i) poor rural households use child labor to cope with income shocks, but at the expense of leisure or studying time of children, not at the expense of school enrollment; (ii) shocks have heterogeneous effects on children by age and sex; (iii) the relationship between economic shocks and school enrollment is ambiguous, as different types of shocks are likely the product of heterogeneous impacts; (iv) credit-constrained households have a higher probability of using child labor as a risk-

² In fact the program was controlled randomly assigned. That is, control municipalities were selected to be as similar as possible to the randomly selected treatment municipalities.

coping instrument; and (v) the effect of shocks should be estimated at intensive and extensive margins to account for complementarities of schooling and working activities.

With respect to the safety net value of FA, we find that the program consistently reduces the number of hours of child labor and increases the number of study hours, but not school attendance, for households under shocks. Alternatively, we found that the program provides strong incentives for children to combine work and school when households are exposed to shocks. The results of this paper reveal that CCT programs can work as insurance for the schooling of the poor but are not able to completely displace costly risk-coping strategies. However, the final well-being of children is still in question.

The remainder of this paper is as follows. The next section provides an overview of the program and a description of the evaluation sample used for the empirical analysis. Section 3 reviews previous studies on the effects of CCT programs and income shocks on school enrollment and child labor and describes a theoretical model that predicts the impacts of shocks on school and child labor. Section 4 describes the data used in this study and provides empirical evidence on child labor, the occurrence of shocks, and control variables including the access to credit among poor households in Colombia. Section 5 gives the methodology and econometric models for school attendance and work decisions in the presence of shocks. Results are presented in section 6, and section 7 concludes.

2. Familias en Acción

The program Familias en Acción is a welfare program run by the Colombian government to foster the accumulation of human capital in rural Colombia. It is similar to other CCT programs, such as Progresa, in Mexico (now called

Oportunidades); Red de Protección Social, in Nicaragua; and Bolsa Familia, in Brazil, that have been implemented in middle-income countries during the last decade in an effort to break the intergenerational transmission of poverty. The FA program is aimed primarily at improving the education, health, and nutrition of poor families. The nutrition component consists of a basic monetary supplement that is given to all beneficiary families with children under seven years of age. The health component consists of vaccinations and growth and development checks for children, as well as courses on nutrition, hygiene, and contraception for their mothers. Participation in the health component is a precondition for receiving the benefits of the nutritional component. All children between 7 and 18 years old are eligible for the educational component. To receive the grant, they must attend classes during at least 85% of the school days in each school month as well as during the whole academic year. The size of the grant increases for secondary education and is equal for girls and boys. The amount of the subsidy on a monthly basis at the time of the baseline survey was 14,000 Colombian pesos (COP) or (US\$6) for each child attending primary school and COP\$28,000 or (US\$12) for each child attending secondary school in 2005. The nutritional supplement³ is paid to families with children aged between 0 and 6 years. The amount is COP\$46,500 or (US\$20) per family per month. The average transfer received per household is COP\$61,500, which represents approximately 25% of average household income of beneficiary households. In general, all the transfers are received by the female head of the household every two months.

³ This subsidy is an alternative to participation in a pre-existing program called Hogares Comunitarios. Beneficiaries cannot participate in both programs with the same children. However, families with children both under and over the age of 6 can choose to send the young children to a Hogar Comunitario and to participate in FA with the older children.

Familias en Acción determined household eligibility in two stages: first by identifying target communities and then by choosing low-income households within those communities. Selection criteria for target communities were based on the following conditions. The town must: (i) have fewer than 100,000 inhabitants and not be a departmental capital, (ii) have sufficient education and health infrastructures, (iii) have a bank, and (iv) have a municipality administrative office with relatively up-to-date welfare lists and other official documents deemed important. A subset of 622 of the 1,060 Colombian municipalities qualified for the program. Eligible households were those registered at SISBEN⁴ level 1 at the end of December 1999, with children under 17 years old, living in the target municipalities. SISBEN 1 households account for roughly the lowest quintile of Colombia's household income distribution (Attanasio, 2004).

The program started operating in the latter half of 2002.⁵ It has benefited approximately 1,500,000 households since its beginning, and the cost has ascended to the sum of 300 thousands of millions of Colombian pesos annually (US\$150 million). The cost of the program corresponds to the 0.5% of the Colombian GDP and represents approximately 10% of educational expenditures in the country.

The Evaluation Sample

For evaluation purposes, it was decided to construct a representative stratified sample of treatment municipalities and to choose control municipalities

⁴ SISBEN, Sistema Unificado de Beneficiarios, is a six-level poverty indicator used in Colombia to target welfare programs and for the pricing of utilities.

⁵ In a few municipalities the program started as early as the end of 2001.

among those that were excluded from the program but that belonged within the same strata. The strata were determined by region and by an index of infrastructure based on health and education. The control towns were chosen within the same stratum to be as similar as possible to each of the treatment towns, in terms of population, area, and quality of life index. Most of the control municipalities were towns with basic school and health infrastructures but without banks or, in the few cases chosen to match relatively large municipalities, just over 100,000 inhabitants. As a consequence, control towns are broadly comparable to treatment towns (Attanasio, 2004). In the end, the evaluation sample was made up of 122 municipalities, 57 of which were treatment and 65 of which were controls.

For each municipality, approximately 100 eligible households were included in the evaluation sample. The total evaluation sample consists of 11,462 households interviewed between June and October 2002 (baseline survey), 10,742 households interviewed between July and November 2003 (first wave), and 9,566 households interviewed between November 2005 and April 2006 (second wave). The attrition rate between the three rounds was approximately 16%.⁶ Most of the observations lost were households which children's age exceeded the required age or households that move from their location and were no possible to find again. The final longitudinal data used in this study include information from 6,519 repeated households, after excluding households that received payments before the baseline survey and households located in control municipalities that received payments

⁶ According to Attanasio (2007) attrition between baseline survey and the second follow up survey is not statistically different between treatment and control households. Therefore we assume that lost of observations is random.

during the second survey⁷. As compliance was very high⁸, more than 97%, we include in the sample all observations from treatment municipalities.

At the household level, the sample consists of families that are potential beneficiaries of the program—that is, households with children from the poorest sector of society. Data are collected at both the household and the individual level. The available data provide a rich set of variables that allows us to measure consumption of durables and non-durables, family composition, household socio-demographic structure, labor supply, nutritional status of children, education, household assets, income, and different shocks to income, for both rural and urban households.

3. Literature Review and Conceptual Framework

A number of studies have measured the impact of uninsured shocks on school attendance and child labor outcomes, suggesting that parents may be forced to draw on their children as labor when other strategies are not available (Beegle, Dehejia, & Gatti, 2006; Duryea, Lam, & Levison, 2003; Guarcello, Mealli, & Rosati, 2003; Jacoby & Skoufias, 1997). Duryea et al. (2003), using data from Brazil, showed that unemployment shocks significantly increase the probability that a child enters the labor force and decreases the probability that the child advances in school. Guarcello et al. (2003) observed a similar response for households in Guatemala. They showed that a negative shock substantially increases the probability that a child works, or works and studies

⁷ A total of 13 municipalities of the control sample were converted to treatment municipalities in 2005, before the second wave of the evaluation survey.

⁸ Reasons for no compliance were due mainly to lack of the required documents and not to lack of interest of participation in the program.

simultaneously, and that access to credit and medical insurance provides risk-coping instruments that help protect children from dropping out of school. Jacoby and Skoufias (1997) developed a model of human capital accumulation under uncertainty with complete and incomplete markets. Using data from International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) set on a panel of Indian rural households, they examined whether fluctuations in family income affect school attendance in the face of financial market incompleteness. They found that child school attendance does decline when poor households are hit by a shock and that school attendance is more responsive to aggregate than idiosyncratic shocks. Finally, Beegle et al. (2006), using data from a household panel survey in Tanzania, investigated the extent to which transitory income shocks lead to increases in child labor and found that household asset holdings mitigate the effects of these shocks.

During the last decade, many have analyzed the role of CCT programs on children's school enrollment and work decisions. Schultz (2004) showed that the Progresa program in Mexico has a positive effect on schooling and helps to reduce child work, particularly for boys, while girls are able to combine school and domestic work. An analysis of the program Bolsa Escola in Brazil found that it has a big impact on increasing school enrollment but it has no influence on child labor (Bourguignon, Ferreira, & Leite, 2003; Cardoso and Souza, 2004). In most cases, there is evidence that the effect of a CCT is much stronger on increasing school enrollment than reducing child labor. However, these studies ignore intensity of work activity, which is clearly very important from a welfare perspective.

Attanasio et al. (2006) provided estimates of the effect of the FA conditional transfer on education and work choices, at both extensive and intensive margins. At the extensive margin they found that FA has a positive effect on school enrollment, especially in older children, a negative effect on domestic work for young children, and a neutral effect on income-generating work. At intensive margin they found the same results, but the magnitudes of the impacts are very different across groups. For instance, the effects on schooling are most pronounced for younger children, yet the increased time at school is not wholly substituted by reduced time at work but by domestic work. Time spent at income-generating activities does not change significantly after the program for any of the groups.

Two works in the conditional cash transfer literature by de Janvry et al. (2006) and Maluccio (2005) evaluated the relationship between economic shocks and the impacts of CCTs on school enrollment. Researchers de Janvry et al. (2006) found that Progresa fully protects children's schooling from the shocks of unemployment and illness of the household head, but natural disasters in the community but does not prevent children from working more when their households are hit by a shock. Maluccio (2005) showed that the Nicaraguan Red de Protección Social protected household's total food expenses and children's school attendance against the effect of the Central America coffee crisis in 2000–2001. Overall, the literature suggests that shocks reduce school enrollment and increase child labor, while CCTs have the reverse effect.

The connection between negative income shocks and decreased schooling when there are credit constraints has been established in a theoretical model by Jacoby and Skoufias (1997). The empirical equations used in this research are based on predictions

and formulations of this model. Jacoby and Skoufias' model assumes that households maximize a utility function defined over current consumption and future children's consumption. Parents supply labor inelastically, and their returns are used to finance current consumption. Children's time can be used either to further increase current consumption through work, to accumulate human capital, or for leisure. Human capital determines children's future consumption. The household can change the intertemporal allocation of consumption by changing the children's labor supply. The presence of credit rationing restricts the budget of the household and, if binding, will inefficiently generate a low level of investment in human capital. Moreover, household income net of children's contribution is not certain but rather is subject to shocks. If capital markets were complete, the realization of such shocks would not affect children's labor supply, as they would be insured (Guarcello et al., 2003).

This model (Jacoby & Skoufias 1997) predicts four possible outcomes for children's activities: three corner solutions and one internal solution. A child can attend school full time, work full time, do neither, or combine work and school. The decision of a household concerning the activities of its children will be guided by an unobservable utility as a function of a set of household characteristics including household expected or permanent income net of children's contribution, a set of proxies for the rate of returns to child work and for cost and returns to schooling, and a set of variables relating to credit rationing, access to public or private insurance mechanisms, and realized shocks (Guarcello et al., 2003). The model suggests a linear relationship between shocks and school enrollment. This result is used to motivate an econometric estimation structure

with linear relationships between shocks, schooling, and program impacts, as presented in section 5.

4. Child Labor, Shocks, and the Access to Credit Control Variable

The data of this study come from the FA evaluation survey, which was designed especially for the purposes of evaluating the impact of the program. The survey collected information on individuals and households located in treatment and control municipalities between 2002 and 2005: the baseline survey was in 2002 (before implementation of the program), the first round was in 2003, and the second round was in 2005. The balanced panel dataset has information of a total of 30,985 individuals, 13,737 children under 18 years old, and 6,519 households.⁹

This dataset has several features that make it particularly appropriate for the empirical analysis in this research. First, the detailed household survey has ample individual and household characteristics, including information on time use of all household members aged ten and older. This includes time spent working for wages at household businesses and non-household business and working without wages doing household chores. The survey also includes information on different household shocks as well as measures of access to credit in each of the interviews. As a consequence, the survey allowed the creation of a valuable balanced panel dataset to model household behavior under risk.

⁹ Households receiving payments from FA during the baseline survey were excluded, as were households without complete information on all three surveys.

Child Labor

In Colombia, an estimated 2.5 million children (10.4% of the total population of children) are forced to work to support their families. Only 60% of all the children in Colombia leave school with a primary school diploma, and 87% of school-age children were enrolled in school in 2005. On average, child laborers work about seven to eight hours per day. Their wages are pitifully low, and most of them receive no health or unemployment benefits (Bernal & Cardenas, 2005).

School starts at the age of 5 in Colombia, and no significant amount of child labor is found below the age of 7. The basic cycle of education requires 9 years of study, and other 3 years are needed to finish high school. Thus, children generally finish the basic cycle at 14 years old and complete school at 17 years old. Although legislation allows children to work legally from the age of 14, for the purposes of this study, child labor is defined as the work of children in the age range between 10 and 17 years old.

We use the time allocation data of FA survey to construct binary indicators of participation in work and school. We consider child labor as a child spending more than one hour working in economic activities or non-paid work, including household chores and work in family business.¹⁰ Participation in school takes the value of one if the child is enrolled in school. We also measure hours of work and hours of study and include time doing homework or other school activities. We focus on four age/sex sub-samples: girls and boys 10–13 years old and 14–17 years old.

Table 1 gives detailed information on children's activities in our sample. Seventy-six percent of the children aged 10–17 years were engaged in work during the baseline

¹⁰ The concept of child labor by International Labor Organization (ILO) standards is not restricted to only economic activities.

survey. Most were employed in family businesses or household chores (72%). A significant proportion—64%—were reportedly working and attending school, while 19% reported attending school only and 12% reported working only. Also, we observed that between baseline and follow-up surveys participation in schooling increased and participation in child labor decreased, for both treatment and control municipalities, while percentage of children that work and study simultaneously remained more or less the same. This suggests that the children who only work are moving to school, which is the main objective of the program, but that the program doesn't prevent children from working and studying simultaneously.. Table 2 shows that child labor is very heterogeneous according to age and sex and urban vs. rural households. In general, child labor is most common in rural areas, in boys, and in older children of both sexes.

Table 1. Children's types of activity, participation percentages

	Baseline			Average of First and Second Rounds		
	Control	Treatment	Total	Control	Treatment	Total
Work only	13.22	11.15	12.37	7.04	5.92	6.58
School only	20.82	17.29	19.38	28.27	21.45	25.5
School and work	61.4	68.65	64.36	61.16	70.68	65.03
None	4.57	2.9	3.89	3.53	1.95	2.89
Observations	7,485	5,120	12,605	7,485	5,120	12,605

Table 2. Child labor by group, participation percentages

	Baseline	First Rounds
Urban	9.9	8.0
Rural	19.4	16.1
Boys	17.4	13
Girls	7.9	7.8
Ages 7–9	3.9	3.1
Ages 10–11	10.7	6.7
Ages 12–14	16.6	12.6
Ages 15–17	27.6	25.7
Observations	12605	12605

Table 3 shows the average number of hours children work and attend school. In the pooled data, children worked an average of 4 hours per day and studied an average of 4 hours per day at baseline. Hours reported for school activities increased in the following surveys by 1.5 hours, and time at work decreased by only 1/4 of an hour. Mean school hours were lower for treatment municipalities at baseline and increased after program participation. The inverse relation is observed for work hours, which decreased after treatment. It is noticeable that time at school increases for both treatment and control households, while time at work remains constant for control households. This evidence suggests that the increased time at school could be not a result of the program but of other observed or unobserved effects.

Table 3. Children’s time use, number of hours by sex/age groups

	Baseline			Average of First and Second Rounds		
	Total	Treatment	Control	Total	Treatment	Control
<i>Work</i>	4.01	4.36	3.72	3.74	3.73	3.75
Boys 10–13	3.55	3.92	3.20	3.30	3.27	3.32
Girls 10–13	3.17	3.56	2.84	2.90	2.91	2.90
Boys 14–17	5.05	5.33	4.83	5.12	5.18	5.07
Girls 14–17	4.03	4.45	3.68	3.87	3.84	3.89
<i>School</i>	4.00	3.34	4.46	5.44	5.51	5.39
Boys 10–13	3.49	2.99	3.84	4.92	5.12	4.78
Girls 10–13	3.45	2.94	3.81	5.00	5.02	5.00
Boys 14–17	5.18	3.96	5.96	6.57	6.65	6.51
Girls 14–17	5.59	4.72	6.18	6.98	6.92	7.02
Observations	21,605	5,120	7,485	21,605	5,120	7,485

Shocks

The variables used to identify the various shocks experienced by households in Colombia were obtained from direct questions in the evaluation surveys. In each of the three survey rounds, the households were asked whether during the last year the household experienced the following shocks: crop or job loss, severe illness of the

household head, death of a household member, bankruptcy, a weather shock.¹¹, or violent attack or displacement. The prevalence of different types of shocks at the household level during each of the cross-section surveys, for the sample of households in treatment and control municipalities, is reported in Table 4. In total, 50% of the households had at least one shock between baseline and follow-up surveys. No statistical difference was observed between treatment and control households for any of the shocks.

Data shows that exposure of the households to crop or job loss is very high—more than 11% of households had at least one crop or job loss. Around 12% of the households reported having the household head ill for more than two weeks at least once over the year prior to the survey. Death of a household member, weather shock, and a household being a victim of violence are less frequent. However, we consider them in the analysis as they can be very harmful to poor families because they not only result in loss of income but also in increased household expenditure.

Table 4. Frequency of shocks on households by treatment and control groups

	Crop Loss or Job Loss	Illness Household Head	Bankruptcy	Death Household Member	Weather	Violence or Displacement
<i>Baseline</i>						
Control	11.39%	12.40%	2.20%	1.81%	1.55%	1.16%
Treatment	9.58%	13.96%	2.14%	2.01%	0.95%	1.02%
T-test	0.483	0.636	0.777	0.709	0.615	0.808
<i>First Round</i>						
Control	12.66%	12.66%	2.47%	1.81%	1.06%	0.95%
Treatment	13.50%	11.28%	2.93%	2.54%	1.25%	1.48%
T-test	0.545	0.645	0.323	0.085	0.913	0.136
<i>Second Round</i>						
Control	12.25%	10.11%	2.87%	2.09%	5.95%	1.50%
Treatment	13.67%	10.60%	2.61%	2.39%	5.57%	1.89%
T-test	0.563	0.574	0.193	0.598	0.469	0.536

Note: Percentage of households hit by a shock during a year previous to the survey. T-test of difference in household means computed clustering at the municipality level.

¹¹ Fire, flood, or other catastrophic weather events.

Control Variables

Table 5 compares mean values of observable characteristics for treatment and control municipalities. The variables included are education, sex, and ages of the child and the head of the household; age composition of the household; number of private and public schools, health centers, and banks in each municipality; and the geographical region where the municipality is located. Other variables are included in order to control for access to some form of insurance: dummies for households that have credit or savings in a bank, if household own a house or land as a measure of collateral, and have health insurance for all family members, dummy variables for less-insured households such as households whose main occupation is agriculture, and a dummy for households headed by a single parent.

Access to credit is a very important variable in the theoretical model used in this research. As a measure of access to credit we use the possession of assets and possession of credit. The possession of assets provides an indication of both the well-being of the household and, by serving as collateral, its ability to borrow money. About 64% of the treatment households are home-owners and about 15 percent of the sample report holding land assets distinct from the land on which they live. Land ownership is much more common in rural areas, as is home ownership. On the other hand, the actual use of credit is very limited, even in municipalities with the presence of a bank. there are not differences in use of credit between treatment and control municipalities prior to the program. Only 5% of the households got loans to buy a house or land, and only 2% got loans from financial institutions for other purposes. However, there were significantly more households with actual debts in treatment municipalities than in control municipalities in

the following surveys. In regard to savings in credit institutions, only 2% of households had savings, and there were not statistical significant differences among treatment and control municipalities.

Table 5. Summary statistics of main variables at baseline survey

	Control		Treatment		T-test
<i>Children</i>					
Age	12.240	(2.235)	12.201	(2.280)	
Sex (Boys) ^a	0.535	(0.504)	0.533	(0.505)	
School grade	3.627	(1.023)	3.609	(0.989)	
<i>Household Head</i>					
Age	47.118	(11.906)	46.377	(11.630)	
Incomplete elementary school	0.466	(0.507)	0.453	(0.503)	
Complete elementary school	0.148	(0.354)	0.149	(0.347)	
Incomplete secondary school	0.083	(0.269)	0.097	(0.295)	
Complete secondary school	0.030	(0.181)	0.042	(0.199)	
<i>Household Composition</i>					
Household size	5.612	(1.771)	5.548	(1.765)	
Number of children 0–6	0.711	(0.962)	0.805	(0.966)	
Members 7–13	1.624	(1.053)	1.715	(1.074)	
Members 14–17	1.311	(0.971)	1.234	(0.948)	
<i>Access to Insurance</i>					
Health insurance ^a	0.858	(0.349)	0.910	(0.286)	
If have debt ^a	0.057	(0.260)	0.071	(0.291)	
Own a house or land ^a	0.683	(0.477)	0.654	(0.481)	
Occupation agriculture ^a	0.116	(0.165)	0.105	(0.156)	
Single parent ^a	0.196	(0.394)	0.187	(0.398)	
<i>Municipality</i>					
No. private schools	4.632	(8.626)	3.788	(9.472)	
No. public schools	37.391	(29.920)	43.334	(29.993)	
No. banks	0.874	(1.585)	1.786	(2.423)	
No. health centers	9.989	(11.258)	10.182	(8.457)	
Rural ^a	0.443	(0.497)	0.556	(0.497)	
Observations	7721		5198		

Notes: Averages based on three rounds. Standard errors in parenthesis. ^a Mean values of dummy variables represent percentages of children living in households that meet each of the conditions of the variables.

5. Methodology and Econometric Model

In this section we discuss the specifications used to examine the effect of shocks on child labor and schooling and whether FA might protect households from using

children as risk-coping instruments. First, we examine the effect of shocks on school attendance prior to the program for treatment and control households. In addition, we test if access to credit prevents households from using children as risk-coping instruments. The role of credit is very important in the theoretical model used to formulate the econometric equations estimated in this paper. According to the theoretical model, households don't have to rely on self-insurance instruments to smooth consumption under the complete credit markets assumption.

To test the assumption that credit-constrained households have a higher probability of taking children out of school to buffer adverse income shocks we use retrospective questions from the baseline survey about school attendance and shocks the year 2001. We exclude households receiving payments from FA prior to the baseline survey. Results from this equation provide evidence regarding to what extent poor rural households in Colombia use children as risk-coping instruments as well as the role of credit in household consumption smoothing. We use the following specification:

$$SE_{ijt} = \beta_1 + \beta_2 S_{ijt} + \theta X_{ijt} + \varepsilon_{ijt} \quad (1)$$

$$CL_{ijt} = \beta_1 + \beta_2 S_{ijt} + \delta_1 C + \delta_2 S_{ijt} C + \theta X_{ijt} + \varepsilon_{ijt} \quad (2)$$

The dependent variable SE is a dummy variable that indicates whether children were enrolled in school and attended more than 85% of the classes each year, and CL indicates whether children received any income during the same year, with subscripts representing the child i , household j , and time t . S is our measure of the income shock; C measures households' access to credit; W is a dummy for each year of the survey; and X contains a set of controls including individual, household, and community characteristics. Equations (1) and (2) are estimated by a fixed-effects logit model.

We anticipate transitory shocks to lead to a decrease in school attendance thus we expect $\beta_2 < 0$ in Equation (1), and $\beta_2 > 0$ (an increase in child labor) in Equation (2). To investigate if the effect of shocks on child labor is due to credit constraints, we examine whether the effect of shocks varies with households' access to credit. The effect of interest is δ_2 , which captures the differential impact of a shock among households with access to credit. To the extent that we believe $\beta_2 > 0$ in Equation (2) is due to credit constraints, we expect access to credit to mitigate the effect of shocks, i.e., $\delta_2 < 0$.

Second, we estimate the effect of being a beneficiary of the FA program on child labor and school enrollment, controlling for access to credit and different income shocks. For that we use a difference-in-difference (DiD) framework, under the assumptions that, conditional on observed individual, household, and community characteristics, unobserved community characteristics do not change before or after the program and there are common time effects across treatment and control areas. The basic DiD equation is represented by Equation (3):

$$y_{ict} = \alpha_0 + \beta_1 C_{ict} + \beta_2 S_{ict} + \beta_3 T_{ict} + \beta_4 C_{ict} S_{ict} + \beta_5 T_{ct} S_{ict} + \beta_6 C_{ict} T_{ict} S_{ict} + \theta X_{ict} + \mu_{ic} + \varepsilon_{ict} \quad (3)$$

The dependent variable is a dummy variable that indicates if children work full time, attend school full time, or combine school with work, with subscripts representing the child i , community c , and time t . S_{it} is our measure of income shocks at household and community levels for the year prior to the survey; T_c is a dummy variable indicating whether the child lives in a treatment municipality; C_{ic} measures households' access to credit; ; and X_{ict} contains a set of controls including individual, household, and community characteristics. The two error terms are μ_{ic} , which

captures all observed and unobserved household or individual level time invariant factors, and ε_{ict} , which captures the unobserved idiosyncratic household or individual and time-varying error. Equation (3) is also estimated for child labor and schooling hours. As before, we anticipate income shocks to lead to an increase in child labor if insurance is limited, i.e., we expect $\beta_2 > 0$ and we expect credit access and FA to mitigate the effect of shocks and displace child labor as an instrument to buffer shocks, or β_4, β_5 and $\beta_6 < 0$, being β_6 higher in absolute value if credit access reinforces the insurance role of FA, or viceversa. . For this model we use observations at baseline data and at each of the following surveys (one year and three years after the implementation of the program). However, we show only the estimated coefficients for the second round of the survey.

The main concern for the empirical analysis is that not randomization of the program may have created heterogeneous characteristics between control and treatment populations. Heckman, Ichimura, and Todd (1997) suggested that nonparametric conditional DiD, or DiD matching estimators, help eliminate initial heterogeneity while at the same time taking advantage of DiD's ability to control for time-invariant characteristics. Compared to the original matching estimator, this method allows for unobserved determinants of participation since it does not require that selection bias is eliminated by conditioning on the observed covariates, only that the bias is the same in the pre- and post-treatment periods. Compared to pure DiD, this estimator has the advantage of being nonparametric, so that successful identification does not depend on specific functional forms for the respective expectations (Heckman et al., 1997).

We estimate the effect of the program on our different dependent variables using non-parametric kernel propensity score, without replacement, controlling for observable

characteristics and imposing common support restrictions. Separate estimates are calculated by each of the shocks analyzed. The estimated effect of the program ATT represents the difference of the mean values of the outcome variables between treatment and control groups and between baseline and second round survey.

6. Results

Table 6 and Table 7 report estimates of shock variables (β_2 and δ_2) on school attendance and child labor prior to the program according with equations (1) and (2). Shock variables are measured as binary variables that indicate when a household experienced any of the following shocks during the year prior to the interview: crop or job loss, illness of a household head, death of a household member, bankruptcy, violence, or a weather shock. According to the survey, these shocks are considered severe shock events. We estimated equations for each shock separately and for a set of pooled binary variable of households that experienced one, two, and three of the above shocks during the year prior to the survey.¹² Regressions were run for age/sex groups, with all specifications control for community-time fixed effects.

Our results suggest that for the specific shocks under scrutiny, children's probability of school attendance is not affected by income shocks with the exception of weather shocks, which increase the probability of school enrollment for boys between 14 and 17 years old¹³. However, we observe that idiosyncratic shocks such as illness and death increase the probability of child labor. Specifically, illness of the household head

¹² Alternatively, we measured shocks as negative changes in reported labor income between the two periods considered. However, we did not find significant estimates for this measure of shocks.

¹³ Although this finding goes against the predictions of our model, we explain it by the fact that weather shocks might reduce labor demand, particularly in agricultural jobs

increases the probability of work by 30% for older boys, while or job loss shocks increase the probability of work by 28% and 18% for older boys and young girls, respectively. On average, a severe income shock increases the probability that young girls and older boys work by 18% approximately.

Parameter estimations of the interaction term of access to credit with shocks indicate that households with access to credit are less likely to increase children’s labor to buffer shocks¹⁴. This result is in line with the predictions of our theoretical model. Finally, we observe that households located in rural areas and households dedicated to agricultural business are positively strongly correlated with child labor, increasing the probability that children work by more than 30%.¹⁵

Table 6. Probability of school enrollment for children 10–17 prior to FA: Fixed effects

Probit Model

	Boys 7–13	Girls 7–13	Boys 14–17	Girls 14–17
Death of a household member	0.050 (0.21)	0.202 (0.16)	–0.122 (0.17)	0.198 (0.20)
Severe illness of the hh head	–0.190 (0.11)	–0.004 (0.12)	0.152 (0.12)	–0.149 (0.15)
Crop or job loss	0.052 (0.08)	–0.021 (0.10)	0.031 (0.10)	–0.011 (0.13)
Weather shock	0.179 (0.13)	0.188 (0.20)	0.313** (0.06)	0.450 (0.33)
Violence shock	0.025 (0.23)	–0.153 (0.16)	–0.054 (0.25)	–0.112 (0.26)
One shock	–0.046 (0.06)	–0.001 (0.07)	0.060 (0.07)	0.055 (0.08)
Two shocks	0.084 (0.06)	0.034 (0.07)	0.069 (0.07)	0.053 (0.08)
Three shocks	0.076 (0.06)	0.086 (0.07)	0.032 (0.07)	0.093 (0.08)

Notes: Shock variables are binary variables that indicate households that experienced a shock during the year previous to the survey. Robust standard errors, clustered at the municipality level, are in parentheses.

¹⁴ We don’t interact access to credit with specific shocks because the number of observations with positive values is very small and in some cases is equal to zero for all observations.

¹⁵ Estimations for control variables are available upon request.

Additional repressors were included but not reported. Municipality-year effects are included. Each individual coefficient is statistically significant at the *10%, **5%, or ***1% level.

Table 7. Probability of work for children 10–17 prior to FA: Fixed effects Tobit Model

	Boys 7–13	Girls 7–13	Boys 14–17	Girls 14–17
Death of a household member	–0.180 (0.17)	–0.101 (0.18)	–0.283 (0.16)	–0.183 (0.16)
Severe illness of the hh head	0.168 (0.12)	0.167 (0.16)	0.301* (0.14)	–0.040 (0.20)
Crop or job loss	–0.007 (0.12)	0.188* (0.09)	0.286* (0.12)	0.145 (0.03)
Weather shock	0.222 (0.34)	0.197 (0.20)	0.337 (0.21)	0.206 (0.15)
Violence shock	0.237 (0.27)	0.391 (0.34)	0.046 (0.18)	–0.160 (0.31)
One shock	0.106 (0.07)	0.197* (0.08)	0.173* (0.08)	0.074 (0.08)
Access to Credit	–0.063 (0.07)	–0.059 (0.02)	–0.135*** (0.03)	–0.107** (0.03)
More than one shocks	0.126* (0.02)	0.169* (0.03)	0.178* (0.03)	0.164** (0.02)
Access to Credit	–0.068 (0.02)	–0.085* (0.03)	–0.173* (0.03)	0.122** (0.02)

Notes: Shock variables are binary variables that indicate households that experienced a shock during the year previous to the survey. Robust standard errors, clustered at the municipality level, are in parentheses. Additional repressors were included but not reported. Municipality-year effects are included. Each individual coefficient is statistically significant at the *10%, **5%, or ***1% level.

To sum up, we observe that poor households in Colombia don't take children out of school to buffer shocks, but credit-constrained households do increase children's participation in work activities. This is an interesting result since evaluations of other CCT programs such as Progresia in Mexico and Red de Protección Social in Nicaragua (de Janvry et al., 2006; Maluccio, 2005) have assumed that parents take children out of school when they face income shocks.¹⁶ Besides, the basic theoretical model that

¹⁶ These studies have no pre-baseline data that allow them to test such assumptions.

describes household decisions regarding education under uncertainty (Jacoby & Skoufias, 1997) predicts a decrease in school enrollment when households face income shocks.

In addition, these findings support the idea that schooling and child labor are not substitutes (Ravallion & Wodon, 2000) and that shocks might affect children's time use at intensive margin rather than at extensive margin. That is, it is possible that income shocks increase the hours of children's labor without reducing time at school, or increase the proportion of children that work and study simultaneously. Thus, the effect of shocks will be absorbed by the study and leisure time of the children.

Results from this section support the following conclusions: (i) poor rural households use child labor to cope with income shocks, but at the expense of the leisure or studying time of children, not at expense of school enrollment; (ii) shocks have heterogeneous effects on children by age and sex; (iii) the relationship between economic shocks and school attendance is in most of the cases insignificant, and different types of shocks are likely the product of heterogeneous impacts; (iv) as predicted by the model, credit-constrained households have a higher probability of using child labor as a risk-coping instrument; and (v) the effect of shocks should account for complementarities of schooling and working activities. These results are used to construct our empirical equations in the following section to estimate the effect of the FA program on children's schooling and working time use.

Impact of FA on Children's Time Use Under Risk

Table 8 shows the estimated average treatment effect on the treatment (ATT)¹⁷ of the FA program on (i) children's school and work hours and (ii) participation in school full time or work full time or the combination of school and work. Impact of the program is estimated using DiD matching methods for each of the shock events considered in this paper, i.e., death of a household member, illness of the household head, crop or job loss, weather, and violence shocks¹⁸. Alternatively, we estimate ATT of FA for the whole sample of households that have been hit by any of the shock events under evaluation, and for households that have hit by more than one shock. We also estimate the effect of the program for households with access to credit and for credit constrained households, under the assumption that the program will serve as safety net for those households.

Considering shocks one at a time, we see that illness of the household head or crop loss increase by 1.25 the average number of school hours for beneficiary households with respect of not been in the program and reduces the number of work hours for children by 0.3 hours. Estimations show that the program consistently reduces the number of hours of child labor and increases the number of schooling hours for households under shocks. As we have observed that households are not likely to take children out of school when they face income shocks, our estimates suggest that the estimated positive effect of the program on schooling hours is on children's time doing homework and studying instead of attending school, which is fixed in many of the cases.

We also observe that access to credit does not reinforce the effect of the program on displacing child labor as a risk-coping instrument and have also an insignificant effect

¹⁷ We exclude households that are not receiving payments.

¹⁸ We are not able to find a good counterfactual for the subsample of households hit by bankruptcy shocks, so don't present results.

on schooling hours. In general, the mitigating effect of the program of adverse shocks on schooling hours is always higher than the mitigating effect of the program on working hours, meaning that the program is more effective at protecting schooling time than at reducing child labor under risk environments. Finally, we see that the program has a higher effect on work time when households face covariate shocks, such as weather and violence shocks, than idiosyncratic shocks. On average, the program increases 1.5 schooling hours, decreases 0.5 working hours for households exposed to shocks.

At the extensive margin, results are also very interesting. For all shocks considered, the program has small or no effects on the probability of children working or studying full time but very important effects on the probability of children working and studying simultaneously. We observe that being a beneficiary of the program increases the probability that children work and study simultaneously by 10% for illness of the household head, by 7% for crop or job loss or violence, and by 8% for households hit by any shock event. We also see that FA increases the probability that children study full time by 4% for households hit by illness of the household head or crop or job loss shocks and reduces the probability that children work full time by 4% for households hit by violence shocks.

For households hit by at least one shock, the program has no significant effect on school enrollment but protects children from working full time. As we observed at the intensive margin, access to credit has no significant effect on child labor when households are hit by one shock. The effect of credit became significant for households hit by more than one shock, protecting that children combine work and school. Therefore, we provide evidence that the FA program is effective in reducing child labor even for

households under risk and provides strong incentives to combine work and school for children under shocks for credit constrained households but not for households with access to credit.

If we compare the impact of the program on households with shocks with the effect of the program in households with no shocks, we find that the program does not fully mitigate the effects of adverse shocks on school and work hours. We find that for households with no shocks the FA program increases schooling hours by 3.18 hours and reduces working hours by 1.05 hours. Thus, at the intensive margin, the effect of the program on households without shocks more than doubles the effect of the program on households with shocks.

At the extensive margin we see that for households without shocks the program increases the probability that children study full time by 5%, increases the probability that they combine school and work by 4%, and reduces the probability that they work full time by 10%. Therefore, the program FA does not fully mitigate the effect of shocks on child labor and child schooling participation decisions but provides some insurance that children will remain enrolled in school by increasing the probability that children combine work and school.

Table 8. Average treatment effect of FA program for the second round of the survey

	Intensive Margin		Extensive Margin		
	School Hours	Work Hours	Study Only	Work Only	School and Work
Death of a household member	2.2486*** (0.9114)	-1.0730* (0.7608)	-0.0434 (0.0913)	-0.0043 (0.0984)	0.0297 (0.1224)
Illness of the household head	1.1594*** (0.3021)	-0.3607* (0.2418)	0.0390* (0.0277)	-0.011 (0.0277)	0.1024*** (0.0368)
Crop or job loss	1.3328*** (0.2643)	-0.3737** (0.2079)	0.0451** (0.0247)	-0.0281 (0.0259)	0.0787*** (0.0331)
Weather	2.4025* (1.5872)	-2.1843** (1.1538)	0.0062 (0.1974)	-0.1079 (0.2066)	0.0773 (0.2506)
Violence or displacement	2.2522** (1.2550)	-2.0045** (0.8991)	0.0749 (0.1466)	-0.0436*** (0.0250)	0.0734*** (0.0326)
One shock	1.4277*** (0.1879)	-0.4904*** (0.1489)	-0.0309 (0.1178)	-0.0301** (0.0180)	0.0846** (0.0236)
*Access to credit	0.7853 (0.4473)	-0.2684 (0.8385)	0.0585 (0.7574)	-0.0341 (0.5426)	-0.1488 (0.3242)
More than shock	1.4624*** (0.1879)	-0.5628*** (0.1489)	0.0209 (0.6836)	-0.0301** (0.0145)	0.0856*** (0.0158)
Access to credit	0.3653 (0.5621)	-0.4672 (0.7849)	0.0275 (0.0178)	-0.0638** (0.0180)	-0.0362*** (0.0236)
No shock	3.1871* (0.3732)	-1.0529** (0.2841)	0.0522*** (0.0103)	-0.1026* (0.0489)	0.0486** (0.0114)

Notes: Shock variables are binary variables that indicate households that experienced a shock during the year previous to the survey. Imbens' standard errors, clustered at the municipality level, are in parentheses. Additional repressors were included but not reported. Each individual coefficient is statistically significant at the *10%, **5%, or ***1% level.

In general, we observe that the FA program effectively displaces costly risk-coping instruments such as child labor and protects study time, not school enrollment, for households under specific shocks, and that access to credit provides some insurance for reducing child labor when households are hit by more than one shock. These results complement previous findings and provide evidence to much of the conjectures in the

literature. Previous studies have found that CCT programs protect enrollment but don't prevent parents from increasing child work in response to shocks, suggesting that children combine school and work. Until now, this internal solution hasn't been tested in the program evaluation literature. This study finds strong evidence that beneficiaries of the program have a higher probability of increasing the child labor supply to buffer shocks in special for credit constrained households but keeping children enrolled in school than if they were not in the program.

7. Conclusions

CCTs such as FA provide cash to poor families imposing conditions in children school attendance. Recent empirical work has suggested that CCTs may be one of the policy instruments that enable households to better cope with adverse economic shocks. For instance, if the effect of the condition on school attendance, acting as a price effect, is much larger than the income effect of economic shocks, then CCTs can protect children's education under risk. In addition, if school and work are substitutes we can expect that increasing schooling will displace child labor as a risk-coping instrument. However, there is strong evidence that the relation between school and work is not one to one and that child work rather displaces study time or leisure time.

This paper goes beyond previous studies by testing the effect of a CCT and income shocks on schooling and labor decisions, allowing for complementarities between school and work activities, and controlling for the credit constraints. Using a panel dataset from the evaluation survey of a CCT program implemented in Colombia, Familias en Accion, we observe that shocks are highly prevalent and that children's

participation in work activities is very high. Based on a theoretical model of human capital accumulation under uncertainty with incomplete markets, our empirical estimations suggest that poor rural households in Colombia use child labor to cope with income shocks at the expense of the children's leisure or studying time, not at the expense of school enrollment. This is an interesting result, as most studies assume substitutability between school and work. In line with the model predictions, we also find that credit-constrained households have a higher probability of using children as risk-coping instruments.

With respect to the safety net value of FA, we find that the program provides strong incentives for children to combine work and school when households are exposed to shocks. Results reveal that CCT programs can work as insurance for the schooling of the poor but are not able to completely displace costly risk-coping strategies such as child labor. Therefore, the role of FA on the safety net of the uninsured will depend on the future returns of studying time at home. That is, if combining school and work results in lower future returns of schooling, then the benefits of the program as a safety net are going to be negligible. Alternatively, if attending school is enough for human capital accumulation, we can say that CCTs serve as a safety net program.

This paper contributes to the literature of household behavior under uncertainty and provides insight into the potentialities of a specific CCT program, Familias en Accion, to protect households from using costly risk management strategies under imperfect credit markets. We show that child labor plays a significant role as a self-insurance strategy of poor households in Colombia. From a policy perspective, results from this research are very useful, as they provide evidence of the unintended effects of a

broad program in Colombia and therefore in its potentialities to effectively reduce poverty in the long term.

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