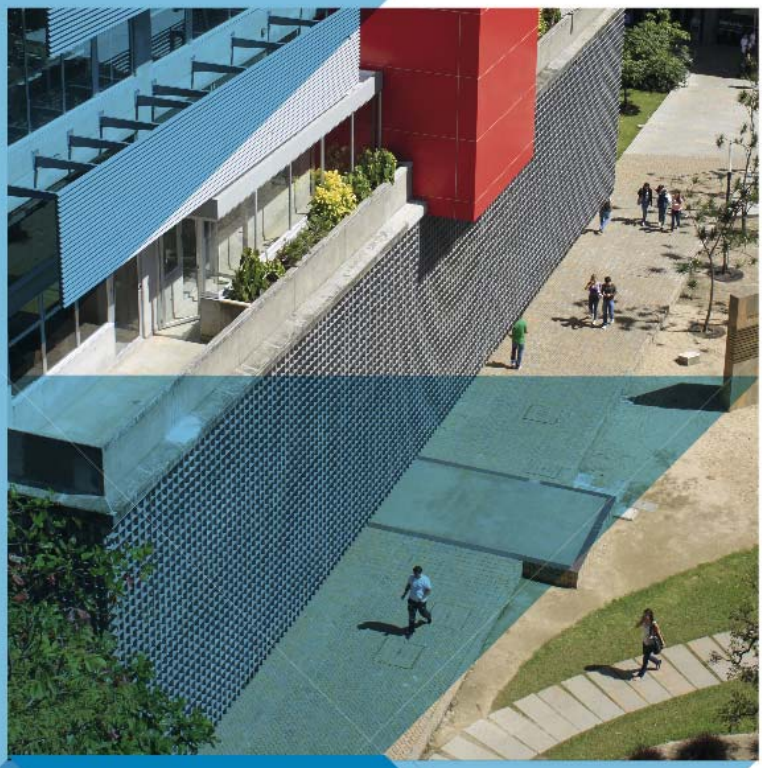

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Canavire, Gustavo; Ospina, Mónica

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Centro de Investigaciones Económicas y Financieras
Universidad EAFIT

Intrahousehold Time Allocation: An Impact Evaluation of Conditional Cash Transfer Programs*

By Gustavo Canavire-Bacarreza and Monica Ospina†

This paper argues that exogenous changes in household income alter the allocation of time within the family. To examine this issue, we propose a theoretical framework that is an extension of the unitary model of intra-household time allocation where conditional cash transfers are received by the household and we test it empirically using non-parametric techniques. This allows us to study the effects of an exogenous shock, such as a conditional cash transfer program, on time allocated to various activities such as work, domestic labor, leisure, and school for children and adults. Using the exogenous change of a conditional cash transfer program in Colombia, "Familias en Accion", we find significant positive effects on work time as well as on leisure and school for children and smaller effects on adult schooling and domestic labor, which support our hypothesis. These results are crucial to fully understand other direct and indirect effects of the program.

JEL: D13, J22, C21

Keywords: impact evaluation, conditional cash transfer, time use, intra-household time allocation

Conditional cash transfer (CCT) programs have been implemented in many developing countries in an effort to increase human capital and alleviate poverty. These programs provide monetary grants to poor families on the condition that the families keep their children in school and take them to regular visits to health clinics. While these programs began in Latin America, they are currently used in more than 40 countries around the world (World Bank, 2011). In trying to accomplish these objectives, CCT programs may affect beneficiary families in many dimensions. These include the level and patterns of consumption, the health conditions of family members, the investment in human and physical capital, and the labor supply of children and adults. A number of studies have shown CCT programs to be effective in increasing school enrollment, reducing child labor and, as a consequence, reducing poverty (Fistbein et al, 2009; Attanasio, Fitzsimons, Gomez, Lopez, Megir and Mesnard, 2006; Schultz, 2004). In addition, some literature has shown some unintended or indirect effects of CCT, such as an increase in savings, change in sexual behavior, crime rate as well as political participation

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† Canavire-Bacarreza: EAFIT University and IZA, Medellín, Colombia, gcanavir@eafit.edu.co. Ospina: EAFIT University, Medellín, Colombia, mospina6@eafit.edu.co.

(Fistbein et al, 2009; Camacho et al, 2012).

To obtain CCTs' direct and indirect effects, families have to modify their behavior at an intra-household level, affecting the time allocated to work, childcare, as well as leisure. This fact has been overlooked in the existing literature despite its importance. There are a number of reasons why intra-household time allocation is important, which can be enhanced (or attenuated) by the implementation of CCTs, particularly in developing countries. First, economic agents (individual or household) in developing countries interact less through market activities than economic agents in developed countries because households (in developing countries) are generally self-sufficient in a number of dimensions. Second, intra-household time is not equally distributed across members. As argued by Ilahi (2000), there are significant differences not only by gender but also by age, social status, wealth, etc. Today, there is extensive literature on the intra-household allocation of resources in developing countries (see, for instance, Haddad et al., 1997). Third, a significant part of the survival of poor households in developing countries is achieved through home production and labor market activities. The primary resource used to attain increased well-being is the time of the household members. At the same time, leisure (which is the opposite of work) is a good that individuals obtain welfare from. Finally, and more importantly, development policy interventions aimed at increasing well-being, such as safety nets, basic services projects, and agricultural extension programs, can learn a lot from information on time use. Whether or not some or all household members have time constraints can have a crucial impact on the success of the projects (Ilahi, 2000). Thus, this paper aims to shed some light on the effects of income on intra-household time allocation by providing information on the effects of CCT programs on intra-household time allocation to various activities, such as market work, domestic labor, school, and leisure for children and adults. To our knowledge, evidence of the extent to which these transfers affect intra-household time allocation is limited with evaluations in Mexico (Parker and Skoufias, 2000) and Brazil (Bourguignon, Ferreira, and Leite, 2003); furthermore, evidence of the extent to which adult labor supply is affected is also quite scarce and weak (Cuesta, 2004; Foguel and Barros, 2009; Parker and Skoufias, 2000), mostly due to the lack of good data on the time use of household members. The quasi-experimental design of the Familias en Accion (FA) program and the availability of panel data on individual time allocation provide a great opportunity to analyze intra-household time allocation in the context of policy intervention. Whether or not policy interventions limit the time of some or all household members can have a crucial impact on the success of the program and future well-being of the beneficiaries.

In principle, CCT programs can be considered as having both income and price effects. The cash transfer increases household income, which in turn increases both consumption and leisure and reduces the labor supply of all household mem-

bers. This effect is called the income effect. The price effect is associated with meeting the conditions of the program. The condition on school attendance implies a reduction in the shadow wage of children, which would result in an increase in the amount of time that children spend in school relative to work. Induced changes in the allocation of the childrens time are likely to lead to a reallocation of the parents time. These are the cross-substitution effects. That is, if the children become unable to perform certain work or domestic activities, other household members (adults) may substitute to do their work. Therefore, the impact of the CCT program on the time allocation of household members is ambiguous under economic theory. We address this question with a simple theoretical model and test it empirically, considering the substitution possibilities in the time that family members use for household production, paid work, and leisure.

To empirically evaluate the effects, we used the Colombian CCT program "Familias en Accion" (FA), which has been operating since 2002, and rely on panel data surveys particularly conducted to evaluate this program. Our data consist of individual household-level information from municipalities that were included in the program and others that were not. Between 2002 and 2005, one preintervention and two follow-up survey instruments collected data on education, labor, income, and health at individual, household, and community levels. Time-use diary data were collected for all household members older than 10 years during all three rounds. The availability of these data offers an extraordinary setting in which to analyze time-allocation responses to exogenous changes in income.

This paper is organized as follows: Section 2 reviews the literature on time allocation. Section 3 discusses the hypothesis on the program effects within a unitary theoretical model framework. Sections 4 and 5 describe the data and the empirical strategy used in the analysis. Estimation results are presented in Section 6, and Section 7 concludes.

I. Intrahousehold Time Allocation: A Review

The analysis of time use is essentially an analysis of the allocation of time to various activities such as work for wages, work in the family business, domestic chores, and school activities for children. Becker (1965) and Gronau (1977) extended the conventional labor-supply model of consumption and leisure by incorporating home production as another labor activity. The authors argued that work at home (or home production) will respond to economic incentives such as changes in market wages, unearned income, and productivity in a way similar to market work.

In the context of the determinants of intra-household time allocation, several studies have econometrically addressed the effects of age, gender, household composition, market prices, and other variables on the time allocation of household

members. Ellis (1994) presented a good survey of descriptive studies on time-allocation patterns in rural households in developing countries. The studies consistently found that (a) compared to male time use, female time use is more elastic with respect to her and her partners wage rates and the presence of young children in the house; (b) roles and cultural norms are important determinants of time use, and ignoring them introduces bias in time-use equations; and (c) nonwage income deters labor force participation by raising reservation wages and increasing the consumption of leisure.

Evidence of the cross-substitution effects between child labor and adult labor supply is very scarce. Skoufias (1994) estimated the interrelationships among market wage rates and the time allocated by adult male, adult female, and younger household members to market work, home production, and schooling and found that the wage rates of both adults and children are important determinants of the time use of adults and children. From this study, it can be concluded that if labor markets exist, there appears to be an association between adult and child time, usually between the mother and the daughter. Thus, an increase in female wages can increase the female labor supply to market activities and subsequently pull girls into housework.

In spite of the existing literature on time allocation patterns of households, there are some issues that still remain to be developed. First, few studies include nonmarket activities, such as domestic labor, as dependent variables, and fewer are still able to include the time men spend on household chores, primarily because of data limitations. Most of the studies focus only on the labor supply of some household members, usually the men and women in the household. However, a large number of activities in developing countries occur at home; thus, accounting for such activities is very important when we want to determine the welfare of the household as a whole. Second, while there is evidence that household time is not equally distributed across members, there is still little evidence on how the demographic composition by gender/age affects the time allocated to market work, home production, and schooling. The effect of CCT programs on children time allocation has been widely studied in literature. In general, CCT programs have been successful at increasing school enrollment and reducing child work. Frequently, these impacts have been concentrated among older children. Schultz (2004) showed that the Progresa program in Mexico has a positive effect on schooling and helps to reduce child work, particularly for boys, but it also helps decrease domestic work for girls. In Nicaragua, the Red de Proteccion Social (RPS) reduced child work by 3 to 5 percentage points among children aged 7 to 13 (Maluccio and Flores, 2005).

However, some evaluations have found no significant effect on child labor. For example, an analysis of Bolsa Escola, a CCT program implemented in Brazil, finds

that the program has a big impact on increasing school enrollment but has no influence on child labor (Bourguignon, Ferreira, and Leite, 2003; Cardoso Souza, 2004). Attanasio et al. (2006) found that FA has a positive effect on school enrollment, particularly in older children, a negative effect on domestic work for young children, and a neutral effect on income-generating work. In most cases, there is evidence that the effect of CCT programs is much stronger on school than on work and that child labor is usually increased at the expense of child leisure rather than school enrollment. The effect of CCT programs on intra-household time allocation has not been widely explored, although it has been recognized that household is an important intermediary between aggregate policies and individuals and that any change in the constraints, technologies, or prices facing the household will induce it to reallocate resources to conform to the optimized allocation. Ardington, Case, and Hosegoods's (2009) results from South Africa indicate that transfers might affect even more complex within-household interactions, inducing unexpected labor-supply responses. There might also be potential heterogeneity in the effects in gender and age dimensions, among others. In practice, CCT programs appear to have been a modest disincentive or have had null effects on adult work. Parker and Skoufias (2000) have used Progresa time-use data to study the impacts of the intervention on adults' time allocation. The authors found significant effects of the program on female adults' household work but no effects on adults' market labor supply. The data used by Edmonds and Schady (2008) suggest that the Bono de Desarrollo Humano (BDH) program in Ecuador had no effects on the adult labor supply. Only for Nicaragua, there is some evidence of significant negative effects on adult work. Maluccio and Flores (2005) showed that the RPS resulted in a significant reduction in hours worked by adult men in the preceding week (by approximately six hours), with no effect on adult women. The few significant impacts imply adjustments in the intensive margin (hours) rather than in the extensive margin (participation).

II. Model

The theoretical basis to understand the intra-household decision-making process of time allocation is formulated under the unitary model framework, which considers a family as a rational agent who optimizes his utility subject to a common household restriction. The objective is to introduce quality childcare and exogenous transfers into the family decision-making process and to analyze the theoretical relationships between these transfers and the time allocation of the family (labor supply and leisure time).

The unitary model establishes a utility function (eq.1), which represents the family preferences when the household problem is to choose consumption (C) and leisure (l) and each family members time spent with children (t) such that the utility function is maximized. This function is subject to time restrictions

and the usual budget constraints. In this particular case, we consider a family as composed of two parents (husband and wife) and one child.

The superscripts denotes husband (m), wife (f) and children (c). Equation (2) is the budget constraint where $\theta(Q^c)$ is the conditional cash transfer considering the requirements to receive this additional income, which we suppose is a function of quality child care Q^c. Equations (3) and (4) are time restrictions, where $T^j(j = m, f, c)$ is the available time. The quality of childcare is a linear function of each parents time spent with children (t^f, t^m) and private (t^{cc}) or family child care (t^o), $Q^c = t^m + t^f + \delta t^o + t^{cc}$. When family child care is available $\delta = 1$ and zero otherwise. The parameters of the model must satisfy the restriction $\sum_{i=m,f,c} \alpha_j + \beta_i = 1$.

The available time spent with children has an additional term e^c, that represents an entire scholar journey. ϵ_c is a dummy variable that takes the value of one if the child is attending school, and zero otherwise. The decision of school attendance is not subject to the maximization problem of the household. This decision (ϵ_c value) can be interpreted as a function of household wages, non-wage income and other prices such as the cost of schooling. Since we assume that these prices are given for the family, we are not going to focus on this issue until we examine the effects of θ that directly involve school attendance as a requirement to receive this benefit.

$$(1) \qquad Max \;\; U = \sum_{i=m,f,c} \alpha_i ln\left(c^i - \gamma^i\right) + \sum_{i=m,f,c} \beta_i ln\left(l^i\right) + d_1 ln\left(Q^c\right)$$

Subject to:

$$(2) \qquad \sum_{i=m,f,c} c^i + p^{cc} t^{cc} + p^o t^o = y + \sum_{i=m,f,c} w^i h^i + \theta(Q^c)$$

$$(3) \qquad T^m = l^m + h^m + t^m$$

$$(4) \qquad T^f = l^f + h^f + t^f$$

$$(5) \qquad T^c = l^c + h^c + \epsilon_c e^c$$

(6)
$$T^{ch} = t^m + t^f + t^o + t^{cc}$$

To find a unique solution to this problem (given the perfect substitution assumption implicit in the utility function), we assume that $w^m \neq \{w^m, w^f, p^{cc}, p^o\}$ and $p^o = 0$. Another important assumption is the exogeneity of $\theta(\ Q^c)$ in the decision-making process of the household. This implies that the family considers the conditional cash transfer as non-wage income. The labor supply from each family member is shown in the equations 6,7 and 8, where the superscript * denotes the optimum.

(7)
$$h^{*m} = \left(\frac{\alpha_m + \alpha_f + \alpha_c}{\alpha_m + \alpha_f + \alpha_c + \beta_m}\right)\left[T^m - y - w^f h^{*f} - w^c h^{*c} - \gamma + p^{cc} t^{*cc} - \theta(Q^c)\right]$$

(8)
$$h^{*f} = \left(\frac{\alpha_m + \alpha_f + \alpha_c}{\alpha_m + \alpha_f + \alpha_c + \beta_f}\right)\left[T^f - y - w^m h^{*m} - w^c h^{*c} - \gamma + p^{cc} t^{*cc} - \theta(Q^c)\right]$$

(9)
$$h^{*c} = \left(\frac{\alpha_m + \alpha_f + \alpha_c}{\alpha_m + \alpha_f + \alpha_c + \beta_c}\right)\left[(T^c - \epsilon_c e^c) - y - w^m h^{*m} - w^f h^{*f} - \gamma + p^{cc} t^{*cc} - \theta(Q^c)\right]$$

These equations show how the labor supply of each family member is related to the labor supply of the other members; thus, if any of these members increases their optimal labor hours, the other family members can reduce theirs. The effect of a non-wage income such as the conditional cash transfer is negative but it has an indirect effect through the family members labor supply, given the trade-off between each family members labor supply and the symmetric effect of the cash transfer, which induces a simultaneous reduction in the labor hours as shown in equation 10.

(10)
$$\frac{\partial h^m}{\partial \theta} = \left(\frac{\alpha_m + \alpha_f + \alpha_c}{\alpha_m + \alpha_f + \alpha_c + \beta_m}\right)\left[-w^f \frac{\partial h^{*m}}{\partial \theta} - w^c \frac{\partial h^{*c}}{\partial \theta} - 1\right]$$

The optimum labor supply for each family member can be solved in terms of the wages and other parameters in the model:

(11)
$$h^{*m} = \frac{(\alpha_m + \alpha_f + \alpha_c + \beta_f + \beta_c)}{(1 - d_1)} T^m - \frac{d_3}{w^m(1 - d_1)}\left[w^f T^f + w^c(T^c - \epsilon_c e^c) + y - (1 - \delta) p^{cc} T^{cc} - \gamma + \theta)\right]$$

(12)
$$h^{*f} = \frac{(\alpha_m + \alpha_f + \alpha_c + \beta_m + \beta_c)}{(1-d_1)} T^f - \frac{d_4}{w^f(1-d_1)} \left[w^m T^m + w^c (T^c - \epsilon_c e^c) + y - (1-\delta) p^{cc} T^{cc} - \gamma + \theta \right]$$

(13)
$$h^{*c} = \frac{(\alpha_m + \alpha_f + \alpha_c + \beta_f + \beta_c)}{(1-d_1)} (T^c - \epsilon_c e^c) - \frac{d_4}{w^c(1-d_1)} \left[w^m T^m + w^f T^f + y - (1-\delta) p^{cc} T^{cc} - \gamma + \theta \right]$$

If a family receives the CCT θ, ϵ_c must take the value of 1, given the conditions to receive this benefit. This equation implies that the CCT must be greater than the wage income lost by the child to reduce the parents labor supply. If the CCT cannot recover this lost income, both parents have to increase their optimum labor hours.

III. Data

The data used in this paper ccme from the evaluation survey of FA, which was particularly designed particularly to measure the impact of the program. The survey collected information from households located in treatment and control municipalities between 2002 and 2005. The baseline survey was collected in 2002. The first round after the baseline was collected in 2003, and the second round was collected in 2005. The surveys contain information on a wide range of variables, including the socio-demographic household structure, housing conditions, education and health variables for household members, household consumption, labor supply, income, and transfers.

For the purposes of this analysis, we used a module on time-use data that contained information of the time each household member older than 10 years allocates to each of the 6 activities during the day before the interview. These activities were classified into different categories: market work, domestic work and schooling. Market work is defined as paid work or work in their own business; domestic work is defined as household chores without a payment; and schooling is defined as time attending school and activities related to study. We excluded from the sample individuals interviewed on a Sunday or a Monday, because time-use patterns over the weekend are likely to be different from time-use patterns during the week, particularly for children attending school. Given that the reference period (one day) is short, we could expect a certain bias on the individuals allocation of time to each activity.

The survey also has a module on time use after school for children older than seven years conditional on attending school at the moment of the survey. We used these data to test for a substitution/complementary relation between child work, domestic labor, and schooling. Then, these data offered a unique opportunity to identify the effect of the program on children already attending school and the

complementary relation between schooling and other activities.

The final data set used for estimation purposes consists of 21,197 individuals in 5767 eligible poor households, with time-use variables for three years, including pre-treatment data. In this sub-sample, the average household size is approximately seven members, and all households have members younger than 18 years old. The average age of the household head is on average 46 years old, and the average level of education is incomplete primary school for the household head and complete primary school for all other family members.

Table 1—Summary Statistics, Control Variables

	Mean (Y=1)	Mean (Y=0)	Difference	P-value
Age	29.799	29.958	0.159	0.495
Sex	0.499	0.488	-0.011	0.124
Family	6.732	6.643	-0.089	0.015
Literacy	0.809	0.806	-0.002	0.669
Education	3.306	3.394	0.088	0.000
Teens by family	6.424	5.964	-0.460	0.000
Kids by family	1.212	1.058	-0.154	0.000
Elderly by family	0.293	0.321	0.028	0.001
Income per capita	53,394	62,182	8,787	0.000
Education Household head	2.656	2.661	0.005	0.821
Female Household head	0.160	0.149	-0.010	0.042
Age Household head	45.323	46.604	1.282	0.000
married_hhead	0.847	0.850	0.003	0.604
Rooms	2.033	1.990	-0.043	0.000
inadequate housing	0.326	0.295	-0.031	0.000
inadequate services	0.195	0.206	0.010	0.065
Educative necessity	0.038	0.074	0.036	0.000
Overcrowding	0.515	0.531	0.016	0.022
Dependency	0.561	0.532	-0.029	0.000
Occupied	0.404	0.410	0.006	0.400

Table 1 compares mean values of observable household and individual characteristics for treatment and control sub-samples at the baseline. A T-test shows difference between the means with most of the observable dimensions included.

A. Time Use of Adults and Children

In this section, we provide a general description of the labor market activities and time use of the treatment and control groups prior to the implementation of

the program by gender/age groups. Table 2 shows the labor force participation of women and men by age group reported during the baseline survey. Participation in each activity is measured by binary variables indicating the individuals who spend more than one hour on each specific activity. As we can observe, communities where FA operates are characterized by very high labor market participation rates in paid work for men and very low labor market participation rates for women. Women have a higher participation rate in domestic labor in all age groups. Participation in school is very similar for girls and boys.

Table 2—Labor force participation prior to the program, percentages

		Sex		
		Female	Male	Total
10-17 years	Work	7	21	15
	Domestic	63	41	51
	Study	66	58	61
18-60 years	Work	32	72	51
	Domestic	88	26	59
	Study	4	3	3
Older than 60 years	Work	23	63	46
	Domestic	82	28	51
	Study	7	4	5

Table 3 shows the daily hours spent by adults in paid and domestic work. On average men spend five hours on paid work and less than two hours on domestic labor. On the contrary, women spend five hours on average on domestic labor and a little less than two hours on market work. Individuals older than 60 years spend on average 2 hours per day on domestic labor and 2.5 hours on market work. We observe the same specialization of men in market work and women in domestic labor that we found for labor force participation (see Table 2).

Table 3—Time allocation of adults, number of hours

		Treatment					
		Control		**Treatment**		**Total**	
18-60 years	Sex	Mean	SE	Mean	SE	Mean	SE
Hours of paid work	Female	1.31	(0.06)	1.46	(0.07)	1.37	(0.04)
	Male	4.85	(0.09)	4.56	(0.10)	4.73	(0.06)
	Total	2.99	(0.06)	2.88	(0.06)	2.94	(0.04)
Hours of domestic labot	Female	4.74	(0.06)	4.96	(0.06)	4.84	(0.04)
	Male	0.54	(0.02)	0.79	(0.03)	0.64	(0.02)
	Total	2.75	(0.04)	3.05	(0.05)	2.88	(0.03)
Older than 60 years							
Hours of paid work	Female	0.66	(0.14)	0.45	(0.13)	0.56	(0.10)
	Male	3.42	(0.30)	2.99	(0.26)	3.22	(0.20)
	Total	2.24	(0.19)	1.91	(0.17)	2.09	(0.13)

Hours of domestic labot	Female	3.93	(0.22)	3.81	(0.23)	3.88	(0.16)
	Male	0.67	(0.09)	0.79	(0.10)	0.72	(0.07)
	Total	2.06	(0.13)	2.07	(0.13)	2.06	(0.09)

B. Time Use of Children

Child labor is a major problem in Colombia. According to the FA evaluation survey, an estimated 15% of children between the ages of 10 and 17 years were working at the moment of the survey and not attending school. Children tend to begin their labor force participation at early ages, on average at the age of 14 years, to contribute to family income levels.

Child wages are very low relative to those of adults, and most children receive no health or unemployment benefits. One of the principal objectives of FA is to increase child enrollment in and attendance at school and thereby reducing this early labor force participation of children

Table 4—Time allocation of children, number of hours

		Treatment status					
	Sex	**Control**		**Treatment**		**Total**	
Hours of paid work	10-13 years	Mean	S.E	Mean	S.E	Mean	S.E
	Female	0.05	(0.02)	0.03	(0.02)	0.04	(0.01)
	Male	0.22	(0.04)	0.19	(0.04)	0.20	(0.03)
	Total	0.15	(0.02)	0.11	(0.02)	0.13	(0.02)
Hours of paid work	14-17 years						
	Female	0.31	(0.07)	0.14	(0.05)	0.24	(0.05)
	Male	1.16	(0.10)	1.00	(0.11)	1.09	(0.07)
	Total	0.81	(0.07)	0.64	(0.07)	0.74	(0.05)
Hours of domestic labor	10-13 years						
	Female	1.27	(0.05)	1.23	(0.05)	1.25	(0.03)
	Male	0.67	(0.03)	0.91	(0.04)	0.78	(0.03)
	Total	0.94	(0.03)	1.06	(0.03)	1.00	(0.02)
Hours of domestic labor	14-17 years						
	Female	1.81	(0.09)	2.06	(0.09)	1.92	(0.06)
	Male	0.69	(0.04)	0.97	(0.06)	0.81	(0.04)
	Total	1.15	(0.05)	1.43	(0.05)	1.27	(0.04)
Hours of School	10-13 years						
	Female	3.60	(0.10)	4.54	(0.11)	4.03	(0.08)
	Male	3.40	(0.09)	4.11	(0.11)	3.71	(0.07)
	Total	3.49	(0.07)	4.32	(0.08)	3.86	(0.05)
Hours of School	14-17 years						
	Female	2.99	(0.14)	3.55	(0.16)	3.23	(0.11)
	Male	2.39	(0.11)	3.15	(0.14)	2.71	(0.09)
	Total	2.63	(0.09)	3.32	(0.11)	2.92	(0.07)

Time-use data of children who attend school are available for children between 7 and 17 years old; however, we report statistics for children between 10 and 17 years old to make the data comparable to the overall measure of time use. Participation in paid work, domestic work, and leisure time activities after school is reported in Table 5, and the mean number of hours spent on each activity is reported in Table 4. Older children and boys spend more hours in market labor than younger children and girls. However, children who attend school spend most of their time on school-related activities and domestic activities (Table 6).

Table 5—Labor force participation of children conditional on attending school

	Treatment status					
Sexo	**Control**		**Treatment**		**Total**	
10-13 years	Mean	S.E	Mean	S.E	Mean	S.E
Female	0.60	(0.27)	0.53	(0.26)	0.56	(0.19)
Male	2.16	(0.47)	2.14	(0.51)	2.15	(0.35)
Total	1.44	(0.28)	1.35	(0.29)	1.40	(0.20)
14-17 years						
Female	1.37	(0.61)	1.93	(0.78)	1.63	(0.49)
Male	3.37	(0.88)	7.89	(1.38)	5.53	(0.81)
Total	2.44	(0.55)	5.21	(0.85)	3.74	(0.49)

Table 6—Domestic labor participation of children conditional on attending school

	Treatment					
Sexo	**Control**		**Treatment**		**Total**	
10-13 years	Mean	S.E	Mean	S.E	Mean	S.E
Female	58.88	(1.70)	58.29	(1.79)	58.60	(1.23)
Male	36.19	(1.54)	48.49	(1.77)	41.73	(1.17)
Total	46.71	(1.17)	53.28	(1.26)	49.75	(0.86)
14-17 years						
Female	61.26	(2.55)	74.28	(2.48)	67.26	(1.81)
Male	34.62	(2.33)	47.89	(2.56)	40.95	(1.74)
Total	47.05	(1.79)	59.77	(1.87)	53.03	(1.30)

IV. Empirical Model

As usual in non-experimental data, the impact evaluation of a program such as conditional cash transfers cannot be estimated by the simple mean differences of the outcome between treatment and control groups, or in this case, the time use for labor, study and domestic activities. In addition to the program, there are other factors that directly affect this outcome. If we do not control for these factors, the results would be biased. To obtain unbiased estimations, the best

approach is to recreate a randomized experiment, which is by construction independent from these factors. This approach implies that the treatment status must be independent from any factor (covariate) $T \perp X_j, n = 1, 2, ..., n$

$$ATE = E[Y^1|T = 1] - E[Y^1|T = 0] \tag{14}$$

In this research, we find unbiased estimates of the effects of the program by preprocessing our data set with matching methods to obtain an appropriate covariate distribution across the treatment and control groups. Following Rosenbaum Rubin (1983), balancing the covariates when more than one covariate is involved requires conditioning the propensity score, which is defined as follows:

$$P(x) = Prob(T = 1|X_1 = x_1, X_2 = x_2, ..., X_n = x_n) \tag{15}$$

Assuming $T \perp Y^1, Y^0|P(x)$

where $T = 1$ when the unit is in the treatment group and 0 if the unit is in the control group, and X_n stands for all the possible covariates involved. By conditioning with the propensity score, we are able to construct a counterfactual to $E[Y^1|T = 0]$ that is independent from all covariates. We match the sample between treatment and control units using the Mahalanobis algorithm.

$$E[Y^1|T = 1, P(x)] = E[Y^1|T = 0, P(x)] \tag{16}$$

Thus, we can estimate the average treatment effect as follows:

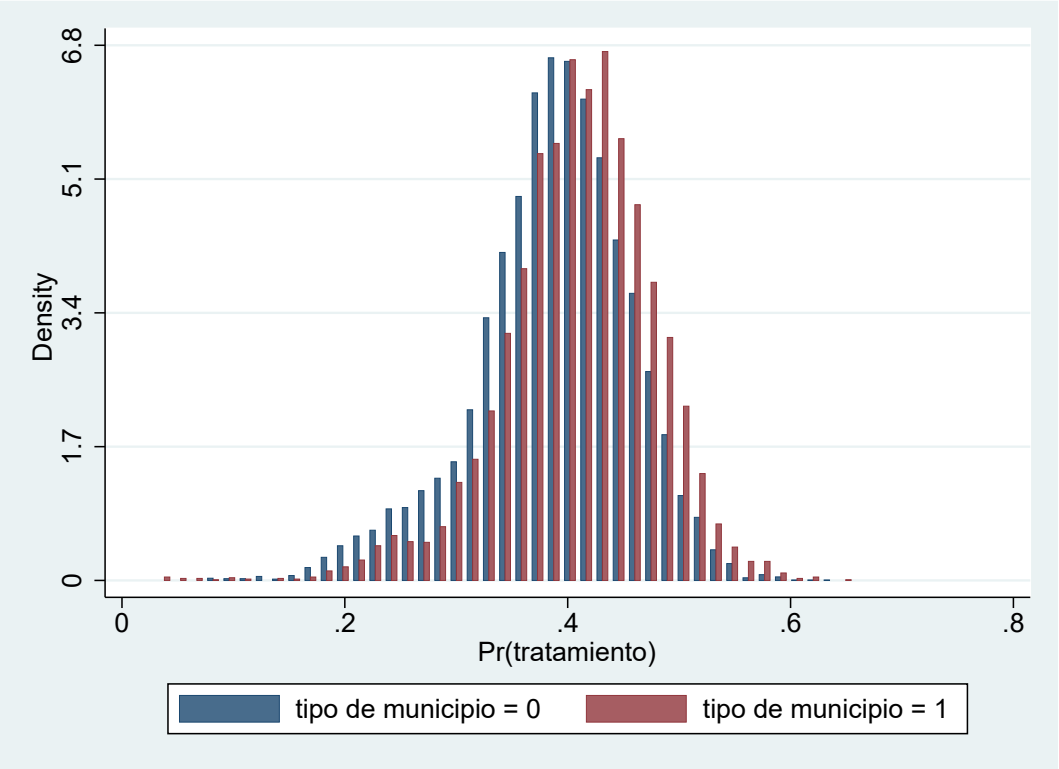
$$ATE = E[Y^1|T = 1, P(x)] - E[Y^1|T = 0, P(x)] \tag{17}$$

A. Control Variables

We use a variety of different variables at the individual and household level to include all possible factors that could affect the treatment status and the time use of each individual for a proper estimation as shown in Equation (17). The parametric estimation of the propensity score includes all variables described in the summary table.

V. Results

The estimation of $P(x)$ was made by using a probit model where the dependent variable is a dummy that takes the value of one if the individual is under treatment and 0 otherwise. The result of this estimation provides a good balance to the estimation in Figure 1. Both distributions overlap each other with a small difference considering that the probabilities of being in a municipality under treatment are concentrated in higher values of the distribution than in the other distribution. However, we ignore the 5% of the data in the tails of the distribution to ignore the spurious matching that can be generated between the data in the tails of both distributions.



The estimation results for time use in labor hours are shown in Table 7. In the unrestricted model (when we take all individuals of the sample), there is no significant difference between the treatment and the control groups. Thus, we can consider that the total hours offered by a family remains constant (without including children younger than 10 years old). However, disaggregating the sample, we can see that the biggest effects of the CCT are concentrated in the population that is actually working; the reduction in labor hours offered by the treatment

group, particularly males, is remarkable

Table 7—Estimation Results (Labor Hours)

			Average		ATT	T-stat
			Treated($Y=1$)	Control($Y=0$)		
Unrestricted			3.17	3.19	-0.02	-0.25
Working	Total	Total	6.87	7.26	-0.39***	-3.26
		$Age \geq 18$	6.93	7.19	-0.26**	-1.98
		$Age < 18$	6.53	7.37	-0.83***	-2.90
	Female	Total	6.03	6.43	-0.40	-1.63
		$Age \geq 18$	6.04	6.33	-0.29	-1.14
		$Age < 18$	6.17	6.96	-0.79	-1.08
	Male	Total	7.15	7.53	-0.38***	-2.82
		$Age \geq 18$	7.28	7.48	-0.21	-1.40
		$Age < 18$	6.60	7.41	-0.81***	-2.59
Unemployed	Total	Total	0.67	0.57	0.11**	1.97
		$Age \geq 18$	0.79	0.70	0.09	1.15
		$Age < 18$	0.54	0.44	0.10	1.62
	Female	Total	0.46	0.40	0.07	1.23
		$Age \geq 18$	0.57	0.52	0.06	0.76
		$Age < 18$	0.27	0.22	0.04	0.67
	Male	Total	1.13	0.93	0.19	1.60
		$Age \geq 18$	1.81	1.55	0.26	0.96
		$Age < 18$	0.82	0.63	0.19*	1.72

With regard to domestic labor (Table 8), there is no significant difference in the unrestricted sample. However, again, when we discriminate, we can see that females and children (except the unemployed ones) have increased their time spent on domestic labor. The unemployed male population, on the other hand, has reduced its participation in these activities.

Table 8—Estimation Result (Domestic Hours)

			Average		ATT	T-stat
			Treated ($Y=1$)	Control ($Y=0$)		
Unrestricted			2.83	2.93	-0.11	-1.35
Working	Total	Total	1.27	1.17	0.10	1.38
		$Age \geq 18$	1.33	1.28	0.05	0.63
		$Age < 18$	0.93	0.54	0.39***	3.22
	Female	Total	3.44	2.96	0.48***	2.67
		$Age \geq 18$	3.61	3.23	0.38**	1.98
		$Age < 18$	2.37	1.28	1.09***	2.62
	Male	Total	0.48	0.50	-0.01	-0.31
		$Age \geq 18$	0.47	0.55	-0.08	-1.45
		$Age < 18$	0.56	0.36	0.20**	2.16

		Total	3.89	4.04	-0.15	-1.30
	Total	$Age \geq 18$	5.83	6.18	-0.34**	-2.15
		$Age < 18$	1.85	1.75	0.10	1.04
		Total	5.41	5.55	-0.14	-1.03
Unemployed	Female	$Age \geq 18$	6.89	7.18	-0.29*	-1.79
		$Age < 18$	2.87	2.64	0.24	1.44
		Total	0.86	1.00	-0.15*	-1.70
	Male	$Age \geq 18$	0.97	1.47	-0.50**	-2.46
		$Age < 18$	0.82	0.84	-0.02	-0.22

The impact on study hours (table 9) has a notable effect on the working population, which has increased its time spent on studying. This result shows that the program is achieving its major objective of reducing child labor and increasing school attendance. There are no significant effects on the unemployed population, except for adult females. However, in this population, the study hours of children are already high, indicating that children are already attending school. Thus, the program has a small effect.

Table 9—Estimation Results (Study hours)

			Average		ATT	T-stat
			Treated ($Y = 1$)	Control ($Y = 0$)		
Unrestricted			1.62	1.58	0.04	0.69
		Total	0.10	0.04	0.06***	2.95
	Total	$Age \geq 18$	0.04	0.01	0.03**	2.27
		$Age < 18$	0.45	0.22	0.23*	1.69
		Total	0.08	0.04	0.03	0.93
Working	Female	$Age \geq 18$	0.03	0.04	-0.01	-0.26
		$Age < 18$	0.69	0.40	0.29	0.62
		Total	0.10	0.03	0.07***	2.85
	Male	$Age \geq 18$	0.05	0.01	0.04***	2.89
		$Age < 18$	0.41	0.16	0.25*	1.76
		Total	2.54	2.47	0.08	0.89
	Total	$Age \geq 18$	0.15	0.10	0.05	1.32
		$Age < 18$	4.67	4.49	0.18	1.48
		Total	1.97	1.92	0.05	0.45
Unemployed	Female	$Age \geq 18$	0.10	0.03	0.07***	2.73
		$Age < 18$	4.78	4.70	0.08	0.45
		Total	3.62	3.52	0.10	0.64
	Male	$Age \geq 18$	0.37	0.47	-0.10	-0.66
		$Age < 18$	4.58	4.38	0.20	1.16

VI. Conclusions

The estimates presented in this study provide some evidence on the effecto of the CCT prgram in Colombia on intra-household time allocation. The analysis

comprises the intended effects on childrens time use and the potential scope of unintended labor supply effects among adults, which is particularly relevant given the increasing coverage of the program across the country. Based on our results, we prove that the program is effective at increasing schooling for all children, while reducing income and reducing domestic labor. Using time-use data on the activities of children after attending school for children enrolled in school before the program, we find that the effect of the program on schooling is mainly a price effect and that the income effect of the program on children already enrolled in school is insignificant. We also observe some patterns of substitution between activities for children attending school as a result of the program. We find that the program increases the leisure time of boys while reducing their paid work but reduces the leisure time of girls while increasing their domestic labor.

The study also examines the effect of the program on adults time use. The most surprising result is the increased labor supply of adults in the program. Particularly, we find that males increased their paid work at the expense of domestic labor and that females increased their domestic labor at the expense of leisure time. Neither economic theory nor previous evidence explains such a behavior. We provided some explanations because this effect was robust across several specifications. First, the income elasticity of leisure may be very low for extremely poor households. This explanation is realistic because the estimated effect of the FA subsidy in our different estimations, when statistically significant, is negative and relatively low. Second, the positive impact of CCT programs on childrens school attendance might free time that was previously spent on childcare, further reducing the cost of work for adults (Baker, Gruber and Milligan, 2005). If hours on labor markets between males and females are substitutes and hours of work between girls and female adults are complementary, as our estimates suggest, this explanation is very plausible. There are other reasons that might help explain why there have not been large disincentives to adults labor supply associated with CCT programs; however, these reasons do likely not likely apply to our program or need further research to be proven. First, for some households, the reduction in income from child work and the increase in school expenditures associated with the additional school enrollment might offset the transfer amount (Fiszbein, Schady, Ferreira, Kelleher, Olinto and Skoufias, 2009). We assume this possibility does not apply to our sample, because the average household transfer is almost equal to the average child income; however, we might need to test for increased schooling costs. Second, it is possible that adults would not change their labor supply if the households perceived the transfers to be temporary rather than permanent (Fiszbein et al., 2009). We believe this assumption is not very probable in this case as FA has continuously been expanded since its implementation in 2002, and the government has promoted FA as a permanent program for the poor. Finally, it is possible that the program has brought changes to wages in the market, changing work incentives. For the purpose of this analysis, we have assumed that the program has not affected market wages.

Nonetheless, it is recommended that future research analyzes the potential general equilibrium effects of the program, which could have important consequences for the interpretation of the effects of the program on different outcomes. This research provides relevant results for our understanding of labor markets in general and of how families respond to public interventions such as CCT programs in particular. The results have large implications for economic policy, because intrahousehold time allocation is crucial to comprehend the income-generation process of the poor and to assess the overall well-being of the program beneficiaries.

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