Household Choices of Child Activities in the Presence of Cash Transfers★

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Abstract

This paper investigates the impact of a government cash transfer on household decisions regarding different activities that a child may perform (schooling, work, leisure). Using data from a randomized evaluation of a cash transfer program in Ecuador, I estimate a choice model to quantify the effect of this policy. The empirical results suggest that the most common behavioral change caused by the program was a reduction in the probability that the household would send the child to work and an increase in the likelihood that a household would choose to combine child labor with schooling. On the other hand, the transfer reduced the allocation of time to certain child working activities, but these results are mainly driven by the effect of the transfer at the extensive margin rather than at the intensive margin. To explain these findings and provide recommendations on how to improve the design of cash transfers, I develop a theoretical model of parental decision-making regarding child activities. Depending on the endowment of skills, a cash transfer attenuates the likelihood of parents choosing market work for their child and increases the likelihood that they may send the child to school or combine child labor with schooling. By modeling the cash transfer as a subsidy of the human capital input and as lump-sum transfer, this study also contributes to the rising evidence that the design of welfare programs strongly matters in terms of achieving program goals.

Keywords: Cash transfer programs, Child labor, Schooling, Idleness
JEL: D10, H53, J13, J22, O15

1. Introduction

Children's participation and allocation of time to different activities could play a significant role in perpetuating poverty in developing countries. According to the International Labor Organization, there are about 152 million children worldwide performing different types of work

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activities. Among them, over 70 million children work in dangerous conditions in agriculture, textile production, domestic labor, and other economic sectors where they are exposed to conditions harmful to their physical, mental, and educational development (ILO, 2017). The eradication of child labor worldwide has long been a goal of many governments and international organizations. Recently, the phenomenon of child idleness has also drawn the attention of scholars and policymakers. In Latin America, many governments have implemented cash transfer programs to mitigate child labor, to improve conditions for poor households and to allow parents to send their children to school rather than to the labor market (Fiszbein et al., 2009; World Bank, 2018). However, are these programs effective in shifting household decisions related to children's activities? And if so, what are the potential mechanisms explaining this behavior?

To analyze the effect of this type of welfare policy on households' decisions, this paper implements an econometric choice model to estimate the impact of a monetary transfer on the child's probability to participate in a particular activity. Using data from a randomized control trial that evaluates a cash transfer program in Ecuador, I estimate the effect of being selected to participate in the welfare program on the household's decision regarding the child's activities. This procedure recovers credible estimates of an average effect of offering the treatment (intention to treat), an informative parameter to evaluate the exposure to the program. However, the structure of the intervention also allows to obtain the effect of receiving the transfer.

To estimate this parameter, first it is necessary to address the problem of the program's implementation, in which the treatment and control groups were contaminated. To overcome the endogeneity problem related to receiving the program, I use the methodology of Petrin and Train (2010) and implement a control function approach, exploiting the lottery selection mechanism to estimate a local average treatment effect. According to the results, separately accounting for different choices is essential when looking at the impact of transfer policies on household behavior related to child's participation in various activities. Specifically, I find that cash transfers lower the probability that the household would send the child to work, increase the likelihood of combining child labor and schooling, and do not significantly modify the household's probability of opting for child leisure. Similarly, I document heterogeneous effects of the program among boys and girls.

An important aspect that has been commonly overlooked while analyzing the behavioral effects of transfer programs is that household decisions could take place both at the extensive and intensive margins. For instance, Doepke and Zilibotti (2005) and Edmonds and Schady (2012) have emphasized understanding economic factors that affect child time allocation as a fundamental component to designing effective child labor regulations and policies. To explore the influence of the transfer at the intensive margin, I estimate the effect of the program on children's time allocation. Then I decompose the program's total impact into its contribution, both at extensive and intensive margins. Using a decomposition approach similar to Carranza et al. (2019), I find that the transfer reduced time allocation to certain children's working activities. However, the total effect is mainly driven by the impact of the transfer at the extensive margin rather than at the intensive one. This result suggests that children in beneficiary households do not work fewer hours conditional on participating in the activity; rather, they are less likely to perform that particular activity.

To explain these empirical results and provide recommendations on how to better design cash transfers, I develop a model of household decision-making similar to that of Bacolod and Ranjan (2008). I extend this framework in two ways: first, I introduce different types of cash transfer policies in the model, which affect the household's available resources; second, following the structure of Belzil and Hansen (2002), I allow children to be endowed with a combination of market ability and school ability. To consider the phenomenon of idleness, I introduce child leisure into the household utility function and educational costs into the budget constraint. Although stylized and simple, this model is apt to qualitatively study the effects of different cash transfer structures on household decisions regarding child activities. Moreover, the results of the model have relevant implications for the design of cash transfer programs, which seek to improve welfare by increasing schooling and mitigating child labor.

Related literature. This paper is closely related to the following two strands of the literature: the literature that evaluates the impact of cash transfers on child schooling and labor, and the one on household behavior related to child's activities.

Over the last 15 years, several studies measured the effects of cash transfer programs on children's education and labor market outcomes (e.g., Das et al., 2005; Schady et al., 2008; De Janvry et al., 2006; Beegle et al., 2006; Dammert, 2009; Behrman et al., 2011; Miller and Tsoka, 2012; Edmonds and Schady, 2012; Galiani and McEwan, 2013; Del Carpio et al., 2016; Sebastian et al., 2019; De Hoop et al., 2020). Many of these papers found that cash transfer programs increase schooling and decrease child's work. However, other articles found no significant effects of cash transfer programs on these child-related outcomes (see, e.g., Glewwe and Olinto, 2004; Behrman et al., 2011; Galiani and McEwan, 2013). Regarding the effect of cash transfers on child labor, substantial heterogeneity has been documented in the magnitude and direction of the impact. For example, Ravetti (2020) shows that among 21 studies evaluating the effect of cash transfers on child work, 7 showed negative effects, 7 showed negative effects only in specific groups of children, and 7 showed increases in child work. Other studies also highlighted the influence of schooling-associated costs and the inherent trade-off between the child's future earnings and the current household income (see, e.g., Fiszbein et al., 2009; Saavedra and Garcia, 2012; Baird et al., 2014).

While said papers and the present study share the interest in evaluating the effect of cash transfers on child schooling and child labor, this paper aims to complement the literature by developing a comprehensive framework that acknowledges the different activities available for children. The empirical literature on cash transfers and child labor has mainly analyzed household decisions using a dichotomous decision framework related to child schooling and work. This framework is not the best option for modeling joint choice (see, e.g., Maddala, 1986; Agresti, 2003; Wooldridge, 2010). By bunching two or more categories into a binary variable, we would be disregarding potentially relevant information for the comprehensive evaluation of the impact of the cash transfer program on household choices. Another common omission in the literature is the failure to consider "idleness" (those who neither work nor study) and overlook children who work and study simultaneously. The present analysis considers all these categories to examine the household's choice comprehensively. Therefore, it departs from the recurrent feature of considering education and child labor as separate decisions.

The combination of experimental data and a flexible model provides unbiased and efficient estimates of the program's effect on household decisions regarding child activities. By underlining the importance of considering available choices such as simultaneous work and study or neither work nor study, this paper contributes to evaluating better the effect of cash transfers on household behavior related to child labor and schooling. This framework aligns with Deb and Rosati (2002) and Rosati and Tzannatos (2006), who document that a significant share of children can be considered as neither enrolled in a school nor engaged in work.[2] Additionally, this paper contributes to expanding the current literature by providing compelling evidence on how the provision of a cash transfer induces adjustments in optimal household decision-making regarding children's time allocation and shows in which margin–either intensive or extensive–the transfer influences households' decisions.

In terms of the literature studying household behavior related to child activities, Bacolod and Ranjan (2008) propose a theoretical and empirical framework that explains how household income and a child's ability affect household decisions regarding the child's activities. Soares et al. (2012) use agricultural shocks on local economic activity in Brazil to demonstrate that improvements in local economic activity are linked to more child labor and less schooling. In contrast, higher household wealth is related to less child labor and higher schooling. Similarly, De Hoop et al. (2017) illustrate how the cash transfer program in the Philippines, which partially subsidizes education, increases schooling and increases paid work.

An associated branch of the literature suggests that societal regulations, labor market conditions and the economic situation of the family could play an important role in defining the parents' choice to send their children to work (Rosenzweig and Evenson, 1977; Basu and Pham, 1998; Dessy, 2000). Regarding the role of income in the trade-off between child labor and the accumulation of human capital, the literature has proposed the so-called "luxury hypothesis" according to which poor households cannot eliminate child labor if the household subsistence needs are not satisfied (Basu and Pham, 1998). This situation implies that, as household income rises, there is a decrease in child labor and a corresponding increase in schooling and leisure. Other studies, such as Baland and Robinson (2000) show that child labor may exist due to credit constraints that preclude parents from borrowing against children's future income. In the same line, Ranjan (2001) explains that liquidity constraints are a driver of inefficiently high levels of child labor.[3]

Considering the findings of these studies, this paper contributes to the literature by presenting a tractable theoretical model that explains the empirical results and offers an insight into how to design cash transfer programs better. The model helps to uncover potential mechanisms that are likely to be relevant in understanding how government transfer programs affect household behavior in terms of child engagement in different activities and how the design of a cash transfer program may affect welfare.

Outline. The rest of the paper is organized as follows: Section 2 summarizes the program's most important features and describes the data. Section 3 shows the methodology of the empirical framework that will be used to measure the effect of the cash transfer program on the outcomes of

[2]Similarly, Biggeri et al. (2003) study the phenomenon of idleness and suggest that household chores, illness or job search can cause children to be absent from both school and economic activity.

[3]Several studies in the empirical literature have evaluated and tested many of the implications of these theoretical models (for example, Ravallion and Wodon, 2000; Bourguignon et al., 2003; Beegle et al., 2006; Manacorda, 2006; Schady et al., 2008; Edmonds and Schady, 2012).

interest and the estimation results. Section 4 presents a theoretical model that explains the results of the empirical analysis and provides recommendations on how to improve the design of cash transfers. Section 5 concludes.

2. The Program and the Data

2.1. Overview of the Program

This paper uses data from a randomized control trial evaluation of a cash transfer program in Ecuador. Ecuador is a middle-income country in South America that is slightly smaller than the state of Nevada. The first cash transfer program in Ecuador was the *Bono Solidario*. It emerged in 1998 as a direct transfer to compensate the poorest households for eliminating subsidies and did not require any actions from the program's beneficiaries. Five years later, in 2003, the program was restructured and merged with the *Beca Escolar* program, which transferred 5 USD per month per child, up to two children per household, if the children were enrolled in a school (with a 90 percent attendance rate). This new combined cash transfer program was called *Bono de Desarrollo Humano* (BDH). It had an open enrollment process that delegated the identification of beneficiaries to local authorities, who were believed to have reliable knowledge of the poor people in their local communities. The new program's benefits consisted of a 15 USD transfer per household per month (about 7 percent of monthly expenditures in recipient households). Later the program adopted a human development approach and was implemented following the recommendations of international organizations. The BDH was one of the first programs to use a proxy means test (PMT) to identify the poorest families in Ecuador. The main objective of this new program was to improve the targeting mechanism of this social policy and contribute to human capital formation. The BDH program required the beneficiary families to enroll their children between the ages of 5 and 18 in a school and maintain an attendance rate of 75 percent or higher. Even though the program's conditionality existed since the creation of the BDH, the enforcement of these requirements became, at most, only partially effective barely since 2007.

2.2. Data Description

The launch of the BDH was accompanied by an evaluation based on a randomized control trial in 4 out of the 24 provinces of Ecuador. A certain number of parishes were taken at random from the provinces chosen for the randomized evaluation.[4] Then, a sample of 1,488 households was chosen at random from the parishes for the evaluation.[5] The households selected for the analysis were randomly assigned to a treatment group called lottery winners" and to a control group called "lottery losers". At the start of the evaluation, each of the selected parishes had, on average, 14 lottery winners and 13 lottery losers. Then a baseline and a follow-up surveys for the BDH

[4]A parish is a local government unit in Ecuador with an average of 26,503 inhabitants.

[5]The criteria for selecting households for the evaluation sample were the following: i) households must be eligible to receive the BDH program; ii) if a household already received the *Bono Solidario* cash transfers, and continued to be eligible for the BDH cash transfer, then the household was excluded; iii) there must be at least one child between 6 and 17 years old in the household at the time the means test data were collected.

evaluation were carried out.[6] Both surveys were conducted by a higher-education institution not involved in the cash transfer program design, implementation, or administration.[7] The final sample used for the analysis comprises 1,883 school-aged children who are located in 72 parishes.

To identify the treatment effects, I will compare lottery winners to lottery losers. This procedure relies on the validity of the randomized assignment. Unfortunately, during the implementation, there was contamination of the control group.[8] This issue implies that examining the lottery effect provides a lower-bound estimate of the underlying treatment effects. Among the households that lost the lottery and should not have received the transfer, 38 percent received the transfers. In contrast, among the households that won the lottery, 69 percent received the transfer (see Table (A.1)). Consequently, due to non-compliance with the experiment, comparing lottery winners and lottery losers is not the same as comparing actual recipients to non-recipients of the transfer. However, being a lottery winner household increases the probability of actually receiving the transfer by 31 percentage points. In this context, I will use the lottery as an instrument for the program's participation (receiving the CT) to estimate the program's effect for those whose chances of receiving transfers were influenced by the lottery. Therefore, I estimate a local average treatment effect (LATE).

2.3. *Types of Children's Activities*

The database contains available information on children's work status and school enrollment. I use any work activity (paid employment, unpaid work, or household chores) to define children's work status. Using the variable that records whether the child is enrolled in a school together with their work status defined as any work, I construct the variable that characterizes different activities available to the child. The choices available are classified as: no school and no work, work and no school, work and school, and school and no work. Similarly, I construct an additional outcome variable that records whether the child is enrolled in a school, but I disaggregate the any work variable into an economic activity (paid employment plus unpaid work) and household chores. In this case, the choices available are expanded and classified as: no school and no work, no school and economic activity, no school and household chores, no school and any work, school and economic activity, school and household chores, school and any work, and school and no work.

2.4. *Descriptive Statistics*

Table (1) presents selected descriptive statistics of children's activities, time use, and household characteristics. All numbers are based on the sample used for the analysis (1,883), differentiating between lottery winners and losers. All households included in the study are composed of at least one child between 11 and 16 years of age, at baseline. Using the proposed definition of child

[6]The baseline survey was collected in the third quarter of 2003 and the follow-up survey was collected in the first quarter of 2005.

[7]This database has been used in several studies that evaluate the effect of cash transfers on child schooling and child work (see, for instance, Schady et al., 2008; Edmonds and Schady, 2012).

[8]The contamination of the control group refers to a mistake during the program's implementation, in which a fraction of the lottery loser's households received the CT, whereas some lottery winner's households did not.

activities (characterizing any work activities as the work status), 2 percent of children neither work nor go to school at baseline, 5 percent are enrolled in a school and do not work, and 32 percent only work. The most prevalent household decision related to child activities, at baseline, is to combine child labor with schooling (around 61 percent).

Consider an alternative definition of child activities that expands the available options thereof. Similar to the previous definition, 2 percent of children neither work nor go to school at baseline, while 5 percent are enrolled in a school and do not work. However, under this alternative definition of child activities, 6 percent of children do not attend school and perform economic activities, 8 percent do not go to school and perform household chores, and 18 percent do not go to school and perform any kind of work activity. Also, according to this definition, 4 percent of children go to school and perform an economic activity, 33 percent of children go to school and perform household chores, and 25 percent of children go to school and perform any kind of work activity.

Table 1: Descriptive Statistics of Household Characteristics by Lottery Status (at baseline)

	Winners[a] (N=993)		Losers[b] (N=890)		Difference (N=1,883)
	Mean	SD	Mean	SD	$a-b$
Child Activities I (%)					
No School and No Work	0.02	0.00	0.02	0.00	0.00
Work and No School	0.32	0.01	0.32	0.02	0.00
Work and School	0.61	0.02	0.61	0.02	0.00
School and No Work	0.05	0.01	0.05	0.01	0.00
Child Activities II (Expanded) (%)					
No School and No Work	0.02	0.00	0.02	0.00	0.00
No School and Economic Activity	0.06	0.01	0.06	0.01	0.00
No School and Household Chores	0.08	0.01	0.07	0.01	0.00
No School and All Work	0.18	0.01	0.18	0.01	-0.01
School and Economic Activity	0.04	0.01	0.04	0.01	0.00
School and Household Chores	0.33	0.01	0.33	0.02	-0.00
School and All Work	0.25	0.01	0.25	0.01	0.00
School and No Work	0.05	0.01	0.05	0.01	-0.00
Child Time Use (Hours)					
Paid Employment	4.09	0.39	4.02	0.40	0.08
Unpaid Economic Activity	6.12	0.35	5.51	0.33	0.60
Economic Activity	10.22	0.5	9.53	0.50	0.68
Unpaid Household Services	9.45	0.29	8.68	0.28	0.76**
Total Hours Worked	19.67	0.56	18.21	0.57	1.44**

Notes: The table shows the set of variables used as dependent variables in the analysis. Additional household characteristics are presented in the Appendix A.1 in Table (A.2). *significant to 10%; **significant to 5%; ***significant to 1%.

Regarding child time use, hours allocated to the different activities include non-participation, which is coded as zero hours in the corresponding activity. Overall, children allocate about 10 hours to economic activities, divided into 4 hours allotted to paid employment and 6 hours to unpaid economic activities. Regarding unpaid household services (housework), children allocate 8 to 9 hours to this type of activity.[9] Table (1) shows that hours in unpaid household services are not balanced between lottery winners and losers. This difference is the main driver of the imbalance between lottery winners and losers in total hours worked. Overall, a child devotes between 18 to 20 hours to work activities at baseline.

It is also important to note substantial participation heterogeneity among low-income children in different activities at different ages. Figure (A.1) in the Appendix A.1 shows participation rates and age, at baseline, for different child activities: no school and no work (idleness), work and no schooling, work and schooling, and schooling and no work. This graph shows that the child participation rate for work and no school increases with child age, whereas the participation rate of concurrently engaging in work and school, and of engaging in school and no work decreases with age. The category representing idleness (no school and no work) is pretty low and stable, with a slight increase as the child ages. Additional household characteristics are also presented in the Appendix A.1 in Table (A.2). These attributes appear to be balanced between lottery winners and losers, except for the gender of the child.

3. Empirical Analysis

The primary goal of the empirical exercise is to estimate the effect of the cash transfer on household decisions regarding child activities (schooling, work, and leisure) and the impact of the cash transfer on hours of work. The first part of this section implements an econometric choice model to estimate the effect of the cash transfer on the probability of selecting a particular activity for the children. The estimation uses a multinomial probit model that takes into consideration the endogeneity of the treatment variable. The combination of experimental data with a flexible discrete choice model provides unbiased and efficient estimates of the program's effect on household decisions regarding child activities. This approach complements previous empirical studies on cash transfers, schooling, and child labor that analyzed household decisions using a dichotomous decision framework.

Although the dichotomous framework is easy to implement, it is not the best option for modeling joint choice (see, e.g., Maddala, 1986; Agresti, 2003; Wooldridge, 2010). By bunching two or more categories into a binary variable, we would be disregarding potentially relevant information for the comprehensive evaluation of the impact of the cash transfer program on household choices. From an econometric perspective, estimating separate estimates for binary variables would be statistically inefficient. From a policy perspective, we are interested in these choices' complement and substitution patterns when a household participates in the program. Therefore, using a multinomial probit model provides a clear advantage in terms of efficiency and flexibility. The second part of the analysis identifies the effect of the cash transfer on the child's allocation of working time and implements a decomposition of that effect into its extensive and intensive margins.

[9]The category total hours worked combines economic activity and unpaid household services. Unpaid household services include household chores such as helping in cleaning, shopping and caretaking.

3.1. Modeling Household Decisions

The household faces a discrete choice with four possible options in relation to the various child activities: no school and no work–idleness (0), work and no schooling (1), work and schooling (2), and schooling and no work (3). I am particularly interested in evaluating how a cash transfer influences these choices. Suppose there is a group of N households. The parent of each child i chooses one of the j mutually exclusive alternatives on the choice set $C_i = \{0, 1, 2, 3\}$. The utility that the household obtains from alternative $j \in C_i$ can be specified as:

$$U_{ij} = X_i\beta + Z_i\phi + \epsilon_{ij} \tag{1}$$

where $Y_{ij} = \mathbb{1}[U_{ij} = \max_{k\in C_i} U_{ik}]$ is the observed household choice and takes the value of 1 if the alternative j has the largest utility among the $k = 4$ elements in the choice set C_i, and zero otherwise. Z is the variable of interest and represents being a lottery winner or loser, X is a vector of observed exogenous variables, and ϵ represents the unobserved part of the utility that takes into consideration the influence of choice attributes that are not measured, such as the ability. The parameter ϕ estimates the effect of winning the lottery on the probability of choosing a particular alternative. In other words, this approach identifies the average causal effect of being offered the lottery on the outcomes related to child activities, i.e., the intention-to-treat effect. This approach uses only the randomized assignment into treatment and control groups and does not consider the endogeneity regarding receiving the cash transfer.

To address this issue, it is possible to use the randomized selection into the cash transfer program as an instrument for the actual reception of the cash transfer. Consider again the utility that household obtains from alternative $j \in \{0, 1, 2, 3\}$:

$$U_{ij} = X_i\beta + T_i\gamma + \varepsilon_{ij} \tag{2}$$

In this case, T represents receiving the cash transfer, X is a vector of observed exogenous controls that affect household utility derived from choice j, and ε represents the unobserved part of the utility. However, ε may not be independent of T, as assumed by standard estimation methodologies. This violation arises as a result of a selection issue. There was contamination of the treatment and control groups during the program's implementation; households eligible to get the program did not get it, and households who were not supposed to get it ended up getting the transfer. To overcome this problem, I follow Petrin and Train (2010) and use a control function approach. The idea behind this correction procedure is to create a proxy variable that conditions on the part of T that depends on ε. Then, the variation that still remains in the endogenous variable will be independent of the error, allowing us to obtain a consistent estimate of the causal effect.

To show the fundamentals of the control function approach, rewrite Equation (2) as:

$$U_{ij} = X_i\beta + T_i\gamma + \xi_{ij} + e_{ij} \tag{3}$$

where $\varepsilon_{ij} = \xi_{ij} + e_{ij}$, ξ_{ij} is correlated with T and e is a normally distributed error term. In this context, T can be represented as a function of all exogenous variables entering utility for any of the choices, the instrument Z, which in this case is the lottery, and an unobserved term μ. Therefore, T is defined as linear in X, Z, and a separable error term:

$$T_i = X_i\pi + Z_i\delta + \mu_i \tag{4}$$

The objective is to create an auxiliary variable that controls for the endogenous component of the error term when it is introduced to the systematic part of the utility function. According to Wooldridge (2010), the conditional expectation of ξ, given v, can perform this function. Assuming that ξ and μ are multivariate normal, the conditional expectation would be:

$$\xi_{ij} = \mu_i\theta + v_{ij} \tag{5}$$

In Equation 5, v is independent of μ and follows a normal distribution with mean zero and variance σ_v^2. Therefore, the error term v is not correlated with T or X. To implement this in practice, first it is necessary to regress T on X and Z, which allows one to consistently estimate the residuals $\hat{\mu}$. Then, we can insert $\hat{\mu}$ into the household choice model to obtain consistent estimators of the model parameters (see, e.g., Ben-Akiva and Lerman, 1985). Therefore, the final estimation is the observed choice Y on X, T, and $\hat{\mu}$. Wooldridge (2015) shows that including $\hat{\mu}$ as an explanatory variable into the structural equation allows one to obtain a new error term that is uncorrelated with all other right-hand side variables, including T. As Wooldridge (2015) explains, one can think of $\hat{\mu}$ as a proxy for the factors in the error term of the structural equation that are correlated with T.

This strategy for dealing with endogeneity in discrete choice models has been widely discussed in the literature (see for instance, Rivers and Vuong, 1988; Petrin and Train, 2003; Guevara and Ben-Akiva, 2006). A cautionary note has been suggested by Wooldridge (2015) when using these types of models with an endogenous dichotomous variable. If this is the case, then it is necessary to use a generalized residual correction. The difference lies in estimating Equation (4) using a probit specification, constructing a generalized residual using the inverse Mills ratio (IMR), and then adding this term in the second stage equation. I implement this procedure to estimate the parameters and then bootstrap the standard errors (clustering at the parish level) for inference purposes.

Finally, regarding potential spillovers that could invalidate the estimates, the design of the experiment in Ecuador considered parishes (primary sampling units) with an average population of 26,503 individuals. There are approximately 14 treated school-age children (on average) participating in the experiment within these parishes. Consequently, spillovers from the experiment are unlikely to occur, and if they exist, they are minimal.

3.2. Decomposing Effects on Time Allocation into Extensive and Intensive Margins

The effect of the program on the decision of the household to allocate child time to different activities can occur both at the extensive margin and at the intensive margin. This distinction is critical because effects at the intensive margin imply that the treatment is changing children's exposure to undesirable activities, such as child labor. I follow the approach proposed by Attanasio et al. (2011) and Carranza et al. (2019) to implement the decomposition of time allocation effects. The strategy proposed in Equation (6) is for working hours; however, the same procedure applies to the other time allocation outcomes. Applying the law of total expectation and using the fact that observed hours are zero for non–working children, it is possible to write the intention to treat effect on work hours as:

$$
\begin{aligned}
&\underbrace{\mathbb{E}\left[Hours \mid Z=1\right]-\mathbb{E}\left[Hours \mid Z=0\right]}_{ITT\ for\ hours} \\
&=\underbrace{\left(\mathbb{E}\left[Hours \mid Z=1, Work=1\right]-\mathbb{E}\left[Hours \mid Z=0, Work=1\right]\right)}_{ITT\ for\ hours \mid employment} \cdot \underbrace{Pr\left[Work=1 \mid Z=1\right]}_{Lottery\ winners\ employment\ rate} \\
&+\underbrace{\mathbb{E}\left[Hours \mid Z=0, Work=1\right]}_{Lottery\ losers\ earnings \mid employment} \cdot \underbrace{\left(Pr\left[Work=1 \mid Z=1\right]-Pr\left[Work=1 \mid Z=0\right]\right)}_{ITT\ for\ employment}
\end{aligned} \tag{6}
$$

On the right-hand side of Equation (6), the first line represents the intensive margin effect. This expression could be zero if the lottery only affects the employment rate but not the working hours of children. The extensive margin effect is represented by the second line on the right-hand side of Equation (6). This term could be zero if the lottery does not affect the employment rate of children. Intuitively, the extensive margin effect on hours is the product of the intention to treat effect on the probability of working times the mean hours for working children in the lottery losers' group (control group). The intensive margin effect on hours is the intention to treat effect on hours minus the extensive margin effect. In Equation (6), the only term that is not identified is the intention to treat effect on hours conditional on employment. Therefore, this term can be consistently estimated using the formula in Equation (6). I use a program that implements this computation, estimating all the expressions as a system and bootstrapping the standard errors for inference purposes. We can follow a similar procedure to decompose the local average treatment effects.[10]

3.3. Results

The results of the discrete choice models that estimate the effect of the program on the probability of selecting a particular activity for the children are reported in Tables (2) to (4). In Tables (2) and (3), for each row, odd-numbered columns contain the results of a particular model, whereas even-numbered columns contain the results of an alternative specification. Each table's first and fourth rows present the estimated probabilities of a household choosing a particular activity. Then, the second and third rows of each table contain the first stage results interpreted as the lottery's intention to treat (ITT) effect. The fifth and sixth rows contain the two-step procedure results interpreted as the cash transfer's local average treatment effect (LATE). It is important to note that the lottery increases the probability of receiving the cash transfer by approximately 31 percentage points, with an F-test of excluded instruments higher than 190. In Table (2), I present the main results of this study. I have also estimated heterogeneous effects over boys and girls in Table (3), and in Table (4), I show the result using the alternative definition of children's activities. The sample consists of children between 11 and 16 years old because they are more exposed to child labor in this age range. Moreover, in the database, child participation in paid employment starts appearing at age 11.[11]

[10] Details of the procedure are provided in the supplementary material (Appendix B.1).

[11] Additional results that consider younger children (5-11) are reported in the supplementary material (Appendix B.2) for reference purposes.

3.3.1. *Household Decisions*

The results in Table (2) show that the estimated probabilities of a household choosing idleness, work only, child labor and schooling, and school only are 3-4 percent, 36-37 percent, 55-58 percent and 3-4 percent, respectively. In terms of the program's effect, the lottery does not significantly change the household's probability of choosing child idleness. The two-stage estimation (LATE) results indicate that receiving the cash transfer slightly increases the probability of choosing child idleness by around 1 percentage point; however, this effect is not statistically significant. An essential objective of the cash transfer program is to mitigate child work, and the evidence suggests that the program successfully meets this goal. In the third and fourth columns of Table (2), the effect of winning the lottery on the probability that a household may send children only to work is reduced by 7 percentage points. Consistent with this result, the effect of receiving the cash transfer decreases the probability of choosing work and no school by 22.7 percentage points.

Table 2: Marginal Effects of the Impact of the CT Program on Household Decisions over Child Activities

	No School and No Work		Work and No School		Work and School		School and No Work	
P(choice)	0.040	0.032	0.365	0.358	0.554	0.581	0.041	0.028
dP/dCT								
ITT	0.006	0.003	-0.064***	-0.069***	0.046*	0.053**	0.011	0.014
	(0.009)	(0.008)	(0.024)	(0.020)	(0.025)	(0.022)	(0.010)	(0.010)
	No School and No Work		Work and No School		Work and School		School and No Work	
P(choice)	0.040	0.032	0.364	0.358	0.555	0.582	0.040	0.028
dP/dCT								
LATE	0.020	0.010	-0.204***	-0.223***	0.143*	0.165**	0.041	0.048
	(0.035)	(0.031)	(0.078)	(0.067)	(0.084)	(0.075)	(0.044)	(0.037)
Controls	×	✓	×	✓	×	✓	×	✓

Notes: The table shows the estimated marginal effect of being eligible for the CT program (ITT) as well as receiving the CT program (LATE) on the household decision related to child activities. For each row, odd-numbered columns contain the results of a model without controls, whereas even-numbered columns contain the results of a model with controls. The sample includes children eleven years and older. The treatment effects are measured as the probability change of choosing a particular option. Including covariates are: age of the child (in years), gender, household size, family composition, presence of parents, log per capita expenditures, an indicator for rural area, an indicator if the household head is male, and an indicator if the child speaks an indigenous language. Standard errors in parenthesis are adjusted for 78 parish clusters and bootstrapped with 500 replications. The sample size is 1,883 observations. *significant to 10%; **significant to 5%; ***significant to 1%.

The evidence also suggests that the program does affect the likelihood that the household may select the option of combining child labor with schooling. The fifth and sixth columns of Table (2) show that the lottery increases the probability of sending the child concurrently to work and school by 5.3 percentage points. Correspondingly, we see that the effect of the cash transfer on this activity is sizable (16.5 percentage points). Table (2) also shows that the policy has slightly improved the children's likelihood of attending school and not working, but these effects have no statistical significance. The last two columns of Table (2) show that the lottery increases the probability that the household will choose only schooling by 1.4 percentage points. Similarly, receiving the cash transfer increases the probability of choosing only schooling by 4.7 percentage points. Overall, these findings indicate that the most common behavioral change caused by the cash transfer was a reduction in the household's probability of only sending the child to work and increasing the probability that the household may choose child labor and schooling concurrently. These results are partially consistent with findings in other contexts that found that cash transfers reduce child work (see, e.g., Schady et al., 2008; De Janvry et al., 2006; Beegle et al., 2006; Dammert, 2009; Galiani and McEwan, 2013; De Hoop et al., 2020). However, my results depart from these studies, as I find evidence suggesting that the program impacts the likelihood that the household may select the option of combining child labor with schooling. These findings highlight the importance of considering concurrent activities when evaluating the effect of this type of program on household decisions related to child participation in different activities.

3.3.2. Heterogeneous Effects

The empirical evidence suggests that the program produces behavioral responses leading to changes in the likelihood that a household may choose certain activities for the child. An examination of heterogeneous effects by gender of the child reveals diverging results of the cash transfer on these activities. Table (3) displays the impact of the policy on child activities, differentiating among boys and girls. In the first two columns, we observe that winning the lottery or receiving the cash transfer does not significantly change the probability of a household choosing idleness for both boys and girls. However, it is interesting to note that receiving the cash transfer raises the likelihood of choosing idleness by 2.1 percentage points for boys and reduces the probability of selecting idleness by 0.3 percentage points for girls. On the other hand, the impact of the lottery on the probability that a household may send the boy exclusively to work is reduced by 5.8 percentage points, whereas for girls, the reduction amounts to 7.6 percentage points. Accordingly, receiving a cash transfer decreases the probability of choosing work and no school by 17.9 percentage points for boys and 25.6 percentage points for girls. These effects are statistically significant and sizeable in magnitude.

Despite the positive effect in reducing child labor, the program appears to have no statistically significant effect on the likelihood that the household may select the option of combining child labor and schooling for boys. This situation is documented in the fifth and sixth columns of Table (3). The lottery increases the probability of choosing school and work by 2 percentage points, and the cash transfer raises the likelihood of this option by 4.5 percentage points for boys. On the other hand, for girls, the lottery increases the probability of combining schooling and child labor by 7.7 percentage points, and the cash transfer increases the probability of this option by 25.4 percentage points. These effects are statistically significant.

The effects of the program on schooling are larger and significant only for boys. Winning the lottery increases the probability of schooling for boys by 3.3 percentage points; receiving the cash transfer increases the likelihood of choosing this option for boys by 11.8 percentage points. For girls, the effects are small and not statistically significant. Overall, the most important behavioral shift caused by the transfer, in the case of boys, is a substitution of child labor for schooling. On the other hand, for girls, the main behavioral effect caused by the program is a substitution of child labor for a combination of child labor and schooling. The findings suggest two critical tradeoffs: child labor versus schooling, and child labor versus a combination of schooling and child labor. In the context of poor households, children with different compositions of market and school abilities are more likely to be selected by their parents to participate in a particular activity. The detection of a considerable positive impact on combining schooling and child labor for girls and no corresponding effect for boys reinforces this interpretation. This result is in line with Behrman et al. (2011), who found that a conditional cash transfer in Mexico increased child work amongst girls; this contrasts with Sebastian et al. (2019), who found that a cash transfer in Lesotho benefited girls more than boys in terms of school enrollment.

Table 3: Marginal Effects of the Impact of the CT Program on Household Decisions over Boys and Girls Activities

	No School and No Work		Work and No School		Work and School		School and No Work	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
P(choice)	0.033	0.026	0.306	0.408	0.611	0.548	0.049	0.017
dP/dCT								
ITT	0.007	-0.002	-0.058***	-0.076**	0.019	0.077**	0.033**	0.002
	(0.014)	(0.015)	(0.020)	(0.032)	(0.025)	(0.033)	(0.017)	(0.009)

	No School and No Work		Work and No School		Work and School		School and No Work	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
P(choice)	0.033	0.026	0.306	0.408	0.612	0.549	0.049	0.017
dP/dCT								
LATE	0.021	-0.003	-0.179***	-0.256**	0.040	0.254***	0.118*	0.005
	(0.053)	(0.057)	(0.068)	(0.097)	(0.090)	(0.097)	(0.071)	(0.034)
Controls	✓	✓	✓	✓	✓	✓	✓	✓

Notes: The table shows the estimated marginal effect of being eligible for the CT program (ITT) as well as receiving the CT program (LATE) on the household decision related to boys' and girls' activities. For each row, odd-numbered columns contain the results of the model for boys, whereas even-numbered columns contain the results of the model for girls. The sample includes children eleven years and older. The treatment effects are measured as the probability change of choosing a particular option. Including covariates are: age of the child (in years), household size, family composition, presence of parents, log per capita expenditures, an indicator for rural area, an indicator if the household head is male, and an indicator if the child speaks an indigenous language. Standard errors in parenthesis are adjusted for 78 parish clusters and bootstrapped with 500 replications. The sample size is 925 observations for boys and 958 observations for girls. *significant to 10%; **significant to 5%; ***significant to 1%.

A tentative explanation of these results is that girls are more likely to be involved in labor tasks than boys due to the assignment of household chores. The evidence suggests that an exogenous increase in household income due to the cash transfer partly mitigates this situation but provides more benefits for boys than for girls in substituting child labor for schooling. This could also indicate that the parents' preferences are heterogeneous, prioritizing the allocation of resources toward boys. Also, it could be that the marginal benefit from girls' schooling (i.e., from devoting resources to the creation of human capital) is perceived as being lower than the current opportunity cost of girls' time, whereas the opposite occurs for boys. Suppose households rely more on girls for household chores and on boys for sustaining current household income through paid work. In that case, it is possible that the magnitude of the transfer was not large enough to significantly change the probability that households would choose school only for girls but was sufficiently large to incentivize households to select this option for boys.

3.3.3. Disaggregating Child Activities

To further analyze the program's effect on household decisions regarding child activities, I expand the set of available choices for the household. The results in Table (4) show the effect of the program on child activities, where work is disaggregated to differentiate the effects over economic activities and housework. For certain choices, the impact of the program remains consistent with the effects obtained in the previous specification. Yet, there are some major differences. The impact of the lottery on the probability that a household may send the children only to work in economic activities (paid and unpaid) is reduced by 3 percentage points. Consistently, the effect of receiving the cash transfer reduces the probability of choosing an economic activity and no school by 10.3 percentage points.

Table 4: Marginal Effects of the Impact of the CT Program on Household Decisions over Child Activities (Extended)

	No School No Work	No School Eco. Activ.	No School HH Chores	No School All Work	School Eco. Activ.	School HH Chores	School All Work	School No Work
P(choice)	0.039	0.059	0.065	0.220	0.037	0.266	0.280	0.034
dP/dCT ITT	0.003	-0.030**	-0.014	-0.025	0.004	0.067***	-0.020	0.014
	(0.009)	(0.012)	(0.012)	(0.018)	(0.010)	(0.019)	(0.020)	(0.010)
	No School No Work	No School Eco. Activ.	No School HH Chores	No School All Work	School Eco. Activ.	School HH Chores	School All Work	School No Work
P(choice)	0.039	0.059	0.065	0.220	0.037	0.265	0.281	0.034
dP/dCT LATE	0.011	-0.103**	-0.036	-0.078	0.014	0.208***	-0.060	0.044
	(0.029)	(0.051)	(0.044)	(0.055)	(0.029)	(0.058)	(0.061)	(0.035)
Controls	✓	✓	✓	✓	✓	✓	✓	✓

Notes: The table shows the estimated marginal effect of being eligible for the CT program (ITT) as well as receiving the CT program (LATE) on the household decision related to child activities. The sample includes children eleven years and older. The treatment effects are measured as the probability change of choosing a particular option. Including covariates are: age of the child (in years), gender, household size, family composition, presence of parents, log per capita expenditures, an indicator for rural area, an indicator if the household head is male, and an indicator if the child speaks an indigenous language. Standard errors in parenthesis are adjusted for 78 parish clusters and bootstrapped with 500 replications. The sample size is 1,883 observations. *significant to 10%; **significant to 5%; ***significant to 1%.

On the other hand, the sixth column of Table (4) shows that the lottery increases the probability of choosing a combination of schooling and household chores by 6.7 percentage points, and the cash transfer raises the likelihood of selecting schooling and household chores by 20.8 percentage points. All these effects are statistically significant. Finally, the last column of Table (4) shows that the lottery increases the probability that the household may choose only schooling by 1.4 percentage points. In the same way, receiving the cash transfer increases the likelihood of selecting only schooling for the child by 4.4 percentage points. However, these effects are not statistically significant.

3.3.4. Household Decisions and Working Hours

The results of the decomposition exercise are presented in Table (5). In this table I show both the intention to treat (ITT) of the lottery and the local average treatment effect (LATE) of the cash transfer on children's working hours. Regarding the impact of the lottery, we see that the child's allocation of time to any work activities (paid employment plus unpaid work plus housework) declined by 11 percent. On the other hand, child allocation of time to economic activities (paid employment plus unpaid work) fell by 26 percent, and child allocation of time to unpaid economic activities decreased by 21 percent. The lottery does not significantly change the allocation of time to paid employment and unpaid household services.

Table 5: Treatment Effects on Child's Time Allocation at Extensive and Intensive Margins

	Any Work Activity		Economic Activity		Paid Employment		Unpaid HH Services		Unpaid Econ. Activity	
	ITT	LATE	ITT	LATE	ITT	LATE	ITT	LATE	ITT	LATE
Total	-0.108*	-0.354	-0.257***	-0.847**	-0.072	-0.239	0.044	0.144	-0.205***	-0.676**
	(0.060)	(0.223)	(0.097)	(0.361)	(0.067)	(0.244)	(0.057)	(0.193)	(0.076)	(0.286)
Extensive	-0.078*	-0.263	-0.278***	-0.935***	-0.081	-0.266	0.007	0.023	-0.225***	-0.759***
	(0.043)	(0.164)	(0.094)	(0.341)	(0.065)	(0.232)	(0.052)	(0.174)	(0.072)	(0.270)
Intensive	-0.030	-0.092	0.021	0.088	0.008	0.027	0.037	0.121	0.019	0.084
	(0.036)	(0.143)	(0.026)	(0.093)	(0.014)	(0.048)	(0.035)	(0.120)	(0.018)	(0.068)
Treatment |	-0.033	-0.100	0.038	0.165	0.047	0.166	0.046	0.151	0.046	0.201
Participating	(0.039)	(0.158)	(0.049)	(0.180)	(0.078)	(0.300)	(0.043)	(0.149)	(0.044)	(0.175)
Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: The table shows the decomposition of the intention to treat and local average treatment effects on hours allocated to different activities into extensive and intensive margin effects. The extensive margin effect is the impact on hours caused by the treatment effect on the probability of working, estimated at the control group mean hours. The intensive margin effect is the difference between the treatment effect on hours and the extensive margin effect, which must be due to changes in hours for each working child in the treatment group. Standard errors in parenthesis are adjusted for 78 parish clusters and bootstrapped with 500 replications. The sample size is 1,883 observations. *significant to 10%; **significant to 5%; ***significant to 1%.

The decomposition shows that the extensive margin effect explains most of the cash transfer effect on children's hours. This result suggests that children in lottery winner households do not work a lesser number of hours conditional on participating in the activity; they are just less likely to be performing that particular activity. Table (5) also shows the local average treatment effect (LATE) of the cash transfer on working hours. Child allocation of time to economic activities falls by 85 percent and child allocation of time to unpaid economic activities decreases by 68 percent. The transfer does not have any effect on the allocation of time to any work activity, paid employment, or unpaid household services. Again, the decomposition shows that the extensive margin effect accounts for the entire effect on hours. Therefore, the cash transfer does not cause the household to reduce the number of hours children allocate to work, conditional on participating in the activity. Instead, the effect on hours is mainly explained by the fact that children in households that receive the transfer are less likely to be performing that particular activity.

4. A Model of Parental Decision-Making Regarding Child Activities

This section develops a stylized model to qualitatively analyze the effects of cash transfer programs on household decisions regarding child participation and allocation of time in different activities. To this aim, I use a household decision-making model similar to Bacolod and Ranjan (2008) and incorporate two types of cash transfers mechanisms and two dimensions of child-specific attributes. The main implication of this model is that the effectiveness of cash transfers in producing behavioral changes in the household decisions regarding child activities depends on the interaction between household resources (affected by an exogenous cash transfer), parental preferences, and child-specific attributes such as the child's ability. By modeling the cash transfer as a subsidy of the human capital input and as lump-sum transfer, this model considers the design of this type of program that typically imposes conditions on school enrollment.

4.1. Model Setup

Consider a household formed by two agents: one parent and one child. In this framework, the parent makes all the decisions.[12] The child is endowed with one unit of time that can be allocated between school (s), the labor market (l), and leisure (h). The household has a unitary structure, and the parent must decide the child's time allocation to each of these activities. The household derives utility from a consumption good purchased in the market denoted by q, the child's human capital denoted by Q, and from the child's leisure time denoted by h. Let's denote the household utility function by:

$$U(q, Q, h) \tag{7}$$

with $U_j > 0$ for $j \in \{q, Q, h\}$ and assume, for simplicity, a quasiconcave structure in its arguments. Assume also that the autonomous income of the parent is given by y. Following Belzil and Hansen (2002), a child is endowed with some combination of market ability (v^w) and school ability (v^s). These two skills will determine how much human capital the child accumulates and how much the child can earn in the labor market upon entering the workforce.[13] Allocating time to schooling is costly. Schooling has a cost $c > 0$ proportional to the time allocated to this activity. On the other hand, if a child with market ability v^w allocates a fraction l of her time to the labor market, the child earns a wage per unit of time worked, which is given by $v^w w$. To have a general framework, the transfers could be interpreted in two ways: as a subsidy of the human capital input, denoted by τ^s, or as a lump-sum cash transfer, denoted by τ. In this context, the household budget constrain is given by:

[12]This assumption is reasonable as the model aims to demonstrate the role of an exogenous windfall of resources in determining household decisions regarding children's activities.

[13]Child market ability can be understood as the aptitude and strength to engage in production that typically increases as the child grows.

$$q + (c - \tau^s)\, s = y + v^w w l + \tau \tag{8}$$

The production of the human capital of a child with school ability v^s, who allocates a fraction s of her time to education, is given by:

$$Q = Q(s, v^s) \tag{9}$$

with $Q_s > 0$, $Q_{v^s} > 0$, $Q_{sv^s} > 0$, $Q_{ss} \leq 0$.

4.2. Household's Optimization

The household has to decide the amount of consumption, the human capital of the child, and the leisure of the child.[14] Given the policy $\Gamma = (\tau^s, \tau)$, the household solves the following problem:

$$\begin{array}{cc} \max\limits_{q,Q,h} & U(q, Q, h) \\ \text{subject to :} & \\ & q + (c - \tau^s)\, s = y + v^w w l + \tau \\ & Q = Q(s, v^s) \\ & s + l + h = 1 \\ & s \geq 0, l \geq 0, h > 0 \end{array} \tag{10}$$

The first and second constraints represent the household budget constraint and the human capital production function, respectively. Note that the lump-sum cash transfer enters directly into the budget constraint, implying that the household has more resources to allocate to schooling and to the consumption good purchased in the market. On the other hand, if the transfer enters as a subsidy of the human capital input, it affects only the relative price of schooling. The third constraint limits the child's total time devoted to schooling, working in the market, and leisure to be equal to the time endowment, which is normalized to 1. Note that the child has a time allocation constraint that makes it impossible for the child to have zero leisure.

For analytical purposes, assume initially that there is only an interior solution. By substituting the constraints into the utility function, the problem of the household is then to decide how much time the child spends at school (s) and the labor market (l). These optimal conditions are given by:

$$- U_q (c - \tau^s) + U_Q Q_s - U_h = 0 \tag{11}$$

$$U_q (v^w w) - U_h = 0 \tag{12}$$

Combining Equations (11) and (12) yields:

$$U_Q Q_s = U_q (v^w w + c - \tau^s) \tag{13}$$

[14] The problem can also be structured such that the household decides the amount of time that the child will devote to schooling and leisure.

Equation (13) requires that, in equilibrium, the marginal benefit from schooling (i.e., from devoting resources to the creation of human capital) equals the marginal cost of schooling resulting from the net cost of schooling (cost minus subsidy) and the forgone utility from labor income.[15]

To analyze the impact of the transfer policies on the outcomes of interest, we can total differentiate Equations (11) and (12) with respect to τ^s and τ to obtain the comparative static results[16]:

$$\frac{ds}{d\tau^s} = \frac{U_{qq}(c-\tau^s)s - U_q}{U_{qq}(c-\tau^s)^2 + U_{QQ}Q_s^2 + U_Q Q_{ss} + U_{hh}} \geq 0, \quad \frac{dl}{d\tau^s} = \frac{-U_{qq}(v^w w)s}{U_{qq}(v^w w)^2 + U_{hh}} \leq 0 \tag{14}$$

$$\frac{ds}{d\tau} = \frac{U_{qq}c}{U_{qq}c^2 + U_{QQ}Q_s^2 + U_Q Q_{ss} + U_{hh}} \geq 0, \quad \frac{dl}{d\tau} = \frac{-U_{qq}(v^w w)}{U_{qq}(v^w w)^2 + U_{hh}} \leq 0 \tag{15}$$

Equations (14) and (15) demonstrate that both types of cash transfers increase the child's allocation of time toward schooling and mitigate child labor, although the magnitudes of these effects could differ.

Next, consider the problem from a more general perspective by allowing for the possibility of a corner solution. The problem can be simplified by introducing the first three constraints into the objective function. Let $\mathcal{L}$ be the Lagrangian and λ, μ and ϕ be the Lagrange multipliers for the constraints $s \leq 1$, $h \leq 1$ and $s + h \leq 1$. The first order conditions (FOCs) for schooling (s), leisure (h), and the corresponding Lagrange multipliers, are the following:

$$\mathcal{L}_s = U_q q_s + U_Q Q_s \leq \lambda + \phi, \quad s \geq 0, \quad s\mathcal{L}_s = 0 \tag{16}$$

$$\mathcal{L}_h = U_q q_h + U_h \leq \mu + \phi, \quad h \geq 0, \quad h\mathcal{L}_h = 0 \tag{17}$$

$$\mathcal{L}_\lambda = 1 - s \geq 0, \quad \lambda \geq 0, \quad \lambda\mathcal{L}_\lambda = 0 \tag{18}$$

$$\mathcal{L}_\mu = 1 - h \geq 0, \quad \mu \geq 0, \quad \mu\mathcal{L}_\mu = 0 \tag{19}$$

$$\mathcal{L}_\phi = 1 - s - h \geq 0, \quad \phi \geq 0, \quad \phi\mathcal{L}_\phi = 0 \tag{20}$$

This set of equations allows the study of the determinants of various child activities. Specifically, I am interested in examining four different scenarios: no school and no work–idleness, work and no schooling, work and schooling and schooling and no work.

Table (6) shows that the choice of each activity depends on two relationships: first, the relationship between the marginal benefit from schooling and its marginal cost; and second, the relationship between the marginal utility from leisure and the opportunity cost of leisure from forgone labor income. This implies that heterogeneity in the child's educational returns (school

[15]This condition can also be interpreted as the tradeoff of the household's willingness to pay for the market good and schooling.

[16]For details on the derivation of these expressions and the evaluation of the sign of the effect, see Appendix B.4.

ability) and heterogeneity in labor market productivity (market ability) are determinants of the choice of the household regarding child activities. Since τ^s is part of these optimal conditions and τ and τ^s have a positive relationship with q, the conditions in Table (6) also imply that transfers affect the optimal decisions of households.

Table 6: Characterization of the Scenarios for Child Activities

		Child Attend School: No	Child Attend School: Yes
Child Work	No	$(h = 1,\ s = 0,\ l = 0)$ $U_Q Q_s < U_q (c - \tau^s) + U_h$ $U_h > U_q (v^w w)$	$(h > 0,\ s > 0,\ l = 0)$ $U_Q Q_s = U_q (v^w w + c - \tau^s)$ $U_h = U_q (v^w w)$
Child Work	Yes	$(h > 0,\ s = 0,\ l > 0)$ $U_Q Q_s < U_q (v^w w + c - \tau^s)$ $U_h = U_q (v^w w)$	$(h > 0,\ s > 0,\ l > 0)$ $U_Q Q_s > U_q (v^w w + c - \tau^s)$ $U_h > U_q (v^w w)$

Notes: The table shows the set of conditions that characterize all the possible scenarios of child activities. Details on the derivations of these conditions are provided in Appendix B.5.

4.3. Analysis

To make the analysis more tractable, I assign functional forms to the utility and the human capital production function. In particular, I assume that preferences are additively separable and given by $U(q, Q, h) = \log(q) + \log(Q) + \psi \log(h)$. For simplicity, assume a human capital production function of the form: $Q = Q(s, v^s) = \alpha + \eta s v^s$. Therefore, the first two FOCs become:

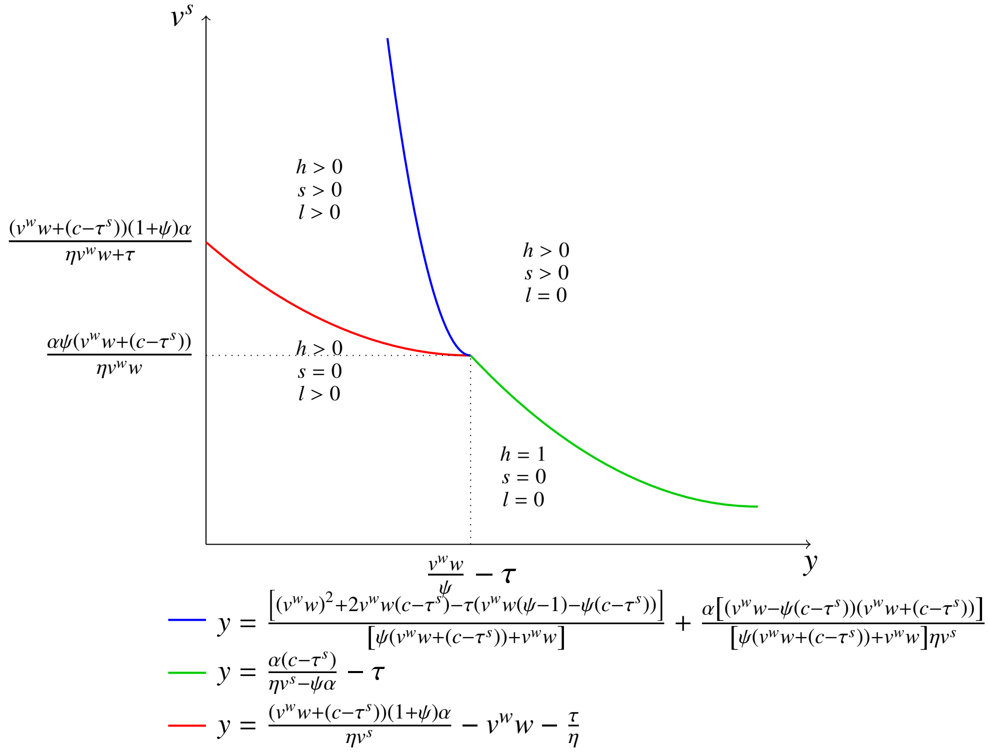
$$\mathcal{L}_s = \frac{\eta v^s}{\alpha + \eta s v^s} - \frac{v^w w + (c - \tau^s)}{y + v^w w - s(v^w w + (c - \tau^s)) - v^w w h + \tau} \leq \lambda + \phi, \quad s \geq 0, \quad s\mathcal{L}_s = 0 \tag{21}$$

$$\mathcal{L}_h = \frac{\psi}{h} - \frac{v^w w}{y + v^w w - s(v^w w + (c - \tau^s)) - v^w w h + \tau} \leq \mu + \phi, \quad h \geq 0, \quad h\mathcal{L}_h = 0 \tag{22}$$

Equations (21) and (22), together with Equations (18), (19), and (20) allow us to characterize the four scenarios corresponding to the above four child activities using the assigned functional forms (for details, see Appendix B.5).

An analytical partitioning of the parameter space with all these four cases is shown in Figure (1). With this framework, one can analyze possible changes in a child's activity patterns. Children with low school ability living in households with limited resources will be sent to work. Considering the threshold $y = \frac{v^w w}{\psi} - \tau$, higher working ability increases the likelihood that the child would work. The lump-sum cash transfer τ provides additional resources to the household and reduces this choice space. Examining the other axis, the expression $\frac{(v^w w + (c - \tau^s))(1+\psi)\alpha}{\eta(y + v^w w) + \tau}$ responds to changes in both types of transfer structures. In particular, as the level of school ability increases, a resource-constrained household will decide to switch from child labor to a combination of child labor with schooling. An increase in both the lump-sum cash transfer τ and the subsidy cash transfer τ^s reduces the thresholds for the only work decision, which implies a reduction in the likelihood of choosing exclusively child labor, since the choice space for this option is reduced. On the other hand, a child with higher working ability would be more likely to only work instead of concurrently working and attending school.

Figure 1: Partitioning of Parameter Space for Household Decision of Child Activities



Notes: This figure shows the partitioning of the parameter space (school ability against household income) and displays all the available household choices regarding child activities. The mathematical derivations are provided on Appendix B.5.

The phenomenon of children who neither work nor study (idleness) arises in households with children who have low market and school abilities. When this happens, parents may rather have the child stay at home. Idleness could be a persistent situation and does not change with only an increase in resources. The model suggests that even in a household with some wealth, with a child endowed with very low school ability, the parent would choose idleness. This implies that contingent on child-specific attributes, the lump-sum cash transfer τ and the subsidy cash transfer τ^s have different effects on the household decision. In the case of a lump-sum transfer, the household may not invest this money in schooling since the parent recognizes that a low school ability child will have a very low rate of return to schooling. In the case of a subsidy cash transfer, since the transfer is contingent on schooling, the likelihood of sending the child to school instead of idleness would increase. A child with a low level of work ability will reinforce idleness, yet as the level of work ability increases, a resource-constrained household with a low school ability child will be more likely to switch from idleness to child work. As the child's school ability increases, a less resource-constrained household will only send the child to school. Both types of cash transfer structures provide additional resources that modify the household's budget constraint and expand the possibility that children endowed with some school ability would attend school.

The heterogeneous effects of the cash transfer on child activities among boys and girls observed in the data could be rationalized in the model by assuming that the parent has different parameters for boys and girls. Specifically, the differential effect could arise if the parent perceives that girls' labor is more productive than boys' labor on average (i.e., the market ability parameter is different). This difference could also occur if the parent believes that girls are less productive in schooling activities than boys (i.e., the school ability parameter or the productivity parameter is different). Also, heterogeneity among boys and girls could occur if the parent has different preference parameters for boys and girls. This theoretical framework sheds light on the importance of child characteristics and the income effect of cash transfers in altering the optimal decisions of resource-constrained households regarding child activities. A graphical illustration of this line of argument is provided in the next section.

4.4. A Numerical Illustration

This subsection presents a simple numerical example to illustrate the key mechanisms of the model. To show the predictions of the theoretical framework, I use a very general parameterization. I choose reasonable values that try to mimic the situation of a poor representative household. Details on the process of assigning values to the parameter are explained in Appendix A.2. The goal is to qualitatively illustrate how the household's decisions regarding child activities respond when we switch from a scenario without a cash transfer to a scenario with a cash transfer. Specifically, I analyze three situations: a scenario with no transfers, a scenario with a cash transfer equivalent to 7 percent of the household income, and a scenario with a larger transfer equivalent to the full cost of schooling. To solve the household optimization problem, I use a simple numerical optimization procedure.[17]

4.4.1. Extensive Margin Responses

To be consistent with the data on household decisions at the extensive margin, I assume that each household can choose to be in one of the four different scenarios: no school and no work (idleness), work and no schooling, work and schooling, and schooling and no work. For example, if the family chooses to send the child to school, s is set to 0.24 to represent approximately 40 hours of school time per week. Similarly, if the family decides to send the child to work, l is set to 0.18 to represent around 30 hours of work per week. Figure (A.2) shows the equilibrium patterns in relation to the two dimensions of the endowment of skills.

Consistent with the empirical findings, in Figure (A.2) we observe that a cash transfer attenuates the likelihood of parents to choose market work for their child and increases the possibility

[17] I use a global optimization procedure to find the best solution of the model in the potential presence of multiple local optima. This procedure is typically used in problems that seek a global solution of a constrained optimization model. Specifically, I used a global search algorithm in MATLAB to find the global maximum using a scatter-search mechanism that generates, analyzes and rejects starting points to improve the best local minimum found iteratively. This method first generates potential start points (trial points). These trial points are then filtered using a score function to remove trial points from the list of points to examine. Finally, the optimization procedure is started from each of the filtered points to find the best local minimum.

of sending the child to school or combining child labor with schooling. Comparing a subsidy cash transfer versus a lump-sum cash transfer, we see that a subsidy is more effective in shifting the household's decision from choosing child labor to picking schooling only or opting for a combination of schooling and child labor. Similarly, the results suggest that the household chooses idleness when the child is endowed with low market and school ability levels. When the level of child market ability is high and child school ability is low, then the household chooses work and no schooling. Conversely, when the level of market ability is low, and child school ability is high, the household selects schooling and no work. Finally, when child market ability and child school ability are both relatively high, the household chooses to combine work and schooling.

4.4.2. Extensive and Intensive Margin Responses

Now, let us analyze household responses both at the extensive and intensive margins. The diagrams in Figures (A.3) and (A.4) show how a child's time allocation equilibrium changes in response to distinct transfer policies under different school and market ability compositions. In these plots, the horizontal axis represents the child school ability parameter. The vertical axis represents the allocation of time to different activities measured as the proportion of time endowment, which is normalized to one. Also, in each figure, I provide two panels representing low and high child market ability scenarios. Recall that school ability determines how much human capital the child accumulates, and market ability can be understood as the aptitude and strength to engage in production that typically increases as the child grows.[18]

Effect of the Lump-Sum Cash Transfer. In Figure (A.3), we can see that a lump-sum cash transfer increases the school time of children that live in beneficiary households (green lines) relative to non-beneficiary households (blue line). However, when the child is endowed with high market ability, the cash transfer is less effective in making the parents choose schooling for the child. When the child has a low market ability (Panel A of Figure (A.3)), we observe that the child does not participate in the labor market. On the contrary, when the child is endowed with a high market ability (Panel B of Figure (A.3)), the lump-sum cash transfer reduces the child's participation in this activity. It is also important to mention that when the child is endowed with low school ability and high market ability, the lump-sum cash transfer induces the household to increase the child's allocation of time to leisure activities rather than to schooling. As the child's endowment of school ability increases, this situation reverts, and the child participates more in school activities.

Effect of the Subsidy Cash Transfer. Like a lump-sum cash transfer, in Figure (A.4), we can observe that a subsidy cash transfer increases child's school time in beneficiary households. However, when the child's school ability is low, the subsidy cash transfer exerts more influence in shifting time allocation towards school activities than a lump-sum cash transfer structure does. This situation occurs in both market ability scenarios (Panels A and B of Figure (A.4)). This implies that, under a subsidy cash transfer, the optimal allocation of hours toward schooling reacts more in comparison with a lump-sum cash transfer. Similar to a lump-sum cash transfer, when the child has a low market ability (Panel A of Figure (A.4)), the child does not participate in the

[18] Evidence supporting this assumption is shown in Figure A.1. We observe that as age increases the child participates more in working activities and is also able to receive higher wages.

labor market. However, when the child is endowed with high market ability (Panel B of Figure (A.4)), the child participates in the labor market, and the subsidy cash transfer is more effective in reducing the child's participation in this activity. Finally, when the child is endowed with low school ability and high market ability, the subsidy cash transfer structure induces the household to reduce the child's time allocation to leisure activities. This implies that the subsidy structure of the cash transfer provides a larger reduction in leisure compared to the lump-sum structure.

4.4.3. Discussion

This simple model is useful to validate the empirical results and qualitatively understand the dynamics that underpin household responses to cash transfers. It also allows showing potential differential effects that alternative cash transfer designs could have on household decisions. The results point to several factors that affect household choices regarding child activities.

First, as the child's school ability increases, the time devoted to school activities also rises. On the other hand, as the market ability increases, the opportunity cost of a child's school time is higher; therefore, the parent will make the child both work and go to school. Note that the optimal allocation of hours toward schooling in the subsidy scenario is more sensitive to both levels of abilities relative to the lump-sum scenario. In a scenario with high market ability, the child's opportunity cost of devoting time to schooling rather than to the labor market increases. Therefore, the parent will opt for sending the child to work and allocate more time toward labor market activities. In this scenario, the cash transfer helps to increase the allocation of time toward schooling. However, the previous figures show that the household is willing to allocate more time toward schooling under a subsidy cash transfer structure.

Second, when the child is endowed with low market ability, the parent does not send the child to work; rather, the child may be in an idleness scenario or may be sent only to school, depending on their level of school ability. When school ability is low, a subsidy cash transfer structure has a lower effect on reducing child labor compared to a lump-sum structure. On the other hand, when the endowment of school ability rises, the subsidy cash transfer structure has a stronger impact on mitigating child labor than the lump-sum transfer. When the child has both low school and low market abilities, the transfer is likely to generate a child idleness scenario.

Third, when the child is endowed with higher market ability, the subsidy cash transfer induces a reduction in the child's allocation of time to leisure activities. In contrast, the lump-sum cash transfer increases the child's allocation time to leisure activities. As the child's school ability increases, there are important reductions in leisure time. This reaction happens because the opportunity cost of devoting the child's time to the labor market or leisure, rather than to schooling, increases. Consequently, the parent is less willing to allocate the child's time to the labor market or leisure; therefore, the parent decides to devote more of the child's time to school activities. The cash transfer contributes to this process as it eases the resource constraint of the household. However, the structure of the cash transfer makes the magnitudes and patterns of the substitution differ, leading to distinct compositions of time allocation.

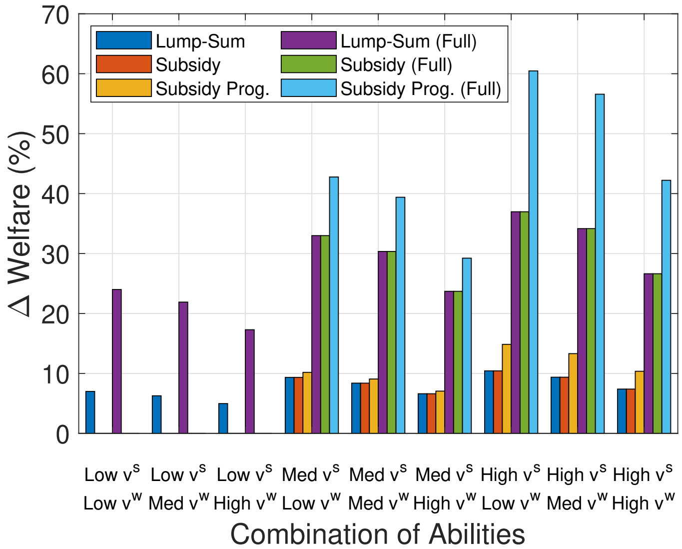
4.5. Welfare Analysis

In this section, I evaluate the effects of changing the transfer policy on welfare. To this aim, I define a benchmark transfer policy as $\Gamma^B = \left(\tau^{sB}, \tau^B\right)$, and compare it with a counterfactual transfer policy $\Gamma^A = \left(\tau^{sA}, \tau^A\right)$. I measure the difference in welfare between the two economies using a consumption equivalent transfer, ω, in terms of the consumption good:

$$U\left(q^B(1+\omega), Q^B, h^B\right) = U\left(q^A, Q^A, h^A\right) \tag{23}$$

The interpretation of ω is the following. Consider two situations, one under the benchmark cash transfer policy, Γ^B, and another under the alternative cash transfer policy, Γ^A. Welfare between the two scenarios would be equal if the households' consumption of the good purchased in the market changed in $\omega \times 100$ percent for the current economy under the benchmark transfer policy, Γ^B. I analyze different counterfactual cash transfer policies that vary by type and magnitude in relation to a benchmark scenario where there is no cash transfer. Specifically, I evaluate three types of cash transfer policies: a lump-sum cash transfer, a subsidy cash transfer, and a progressive subsidy cash transfer. The difference between the standard subsidy and the progressive subsidy is that the former imposes a cap of coverage of up to 0.24 of schooling, whereas the latter does not limit the amount of the time subsidized. The progressive subsidy provides an upper bound of the cash transfer program's potential welfare effects aimed at fostering schooling. Regarding the magnitude of benefits, I evaluate a transfer equal to 7 percent of household income and a transfer that covers full schooling costs.

Figure 2: Welfare Comparison over Skills



Notes: The bars represent the effect of counterfactual policies on welfare over different combinations of child abilities. The benchmark scenario is a situation where there is no cash transfer. The counterfactual policies are: a lump-sum cash transfer, a subsidy cash transfer, and a progressive subsidy cash transfer.

Figure (2) shows the results of the welfare analysis. First, we observe that alternative cash transfer designs could have heterogeneous welfare impacts contingent on the child's characteristics. In all policy scenarios, for a given level of school ability, the effect of the transfer on welfare decreases as the market ability of the child increases. A high market ability lowers the effectiveness of the transfer as it increases the opportunity cost of child labor. However, as child school ability increases, the impact of the transfers on welfare also rises. This situation occurs because the transfer offers more resources to the household prompting the parent to select schooling for the child or to combine child labor and schooling, depending on the child's school ability.

The subsidy cash transfer does not affect welfare in households with a low-school-ability child. This null effect occurs because the household does not choose to send the child to school; consequently, it is not eligible to receive the transfer. Under this scenario, the lump-sum cash transfer is the only transfer structure that generates welfare effects. However, the increase in welfare caused by the lump-sum cash transfer is primarily due to increased consumption and child leisure, which is not in line with the program's purpose.

For households with a child endowed with an average or high level of school ability, the subsidy cash transfer and the lump-sum cash transfer are equivalent in terms of their impact on welfare. This situation happens because the standard subsidy imposes a cap on the coverage of schooling time which is equivalent to the lump-sum cash transfer. Finally, the progressive subsidy cash transfer produces a higher effect on welfare than the lump-sum transfer and the standard subsidy cash transfer in households with a child endowed with an average or higher school ability level. The feature of allowing the household to obtain more benefits contingent on allocating more hours to schooling without any restriction on the quantity of schooling time subsidized provides an upper bound of potential welfare effects that these types of government policies could achieve.

These results have relevant implications for designing cash transfer programs that want to mitigate child labor and promote schooling. The results indicate that it is crucial to consider the transfer structure and children's characteristics when designing government programs intended to improve welfare.

4.6. Exploring Additional Mechanisms

The previously developed theoretical framework admits extensions and modifications. An interesting extension of the model is to consider a simple dynamic framework. In Appendix B.6, I examine an economy in which many identical agents are born in each period and live for two periods, first as children, then as parents. I extend the baseline framework and develop a simple overlapping generations model, incorporating parental time and parental altruism and maintaining all the features of the baseline model. This specification allows me to analyze how a government cash transfer funded by labor income taxes affects household decisions regarding child activities.

The main implication of the extended model is that the effectiveness of cash transfers in producing behavioral changes in household decisions regarding child activities depends on a combination of such factors as the magnitude of income and substitution effects produced by the cash transfer, the child endowment of market and school ability, the household's relative income, the share of beneficiary households in the economy, household preferences, the average level of labor income in the economy and tax rates. To summarize, the results of the extended model suggest that during the development of government programs seeking to improve the welfare of impoverished households, it is critical to consider the children's endowment of skills, parental preferences, the transfer structure, and the government budget constraint.

These results are consistent with the empirical findings and with the results of the benchmark model. Overall, the analytical approach proposed in this study is useful to understand better the mechanisms behind the decisions of households exposed to these types of government programs. It also highlights the main factors that are important to consider when designing effective government programs aimed to increase the well-being of children in poor households.

5. Conclusion

The results of this paper help to shed light on how household decisions related to the child's activities respond when the household receives an exogenous increase in income via a cash transfer. In contrast to previous studies in the literature, the approach implemented in this paper considered the different activities available for children. By combining causal empirical methods and a theoretical model, this paper explains the effects and potential mechanisms of a cash transfer on household decision-making regarding the child's activities.

The empirical evidence suggests that the most prevalent behavioral shift caused by the program was a reduction in the probability of the household sending the child to work and an increase in the likelihood that a household may choose to combine child labor with schooling. Moreover, these effects are heterogeneous among boys and girls. Using an alternative definition of child's activities, this paper shows that the program reduces the probability of sending children only to work in economic activities (both paid and unpaid) and increases the likelihood of combining schooling and household chores. These results highlight the importance of considering different types of working activities when evaluating the effect of cash transfer programs on the well-being of children.

I further analyze the program's effect on allocating time towards working activities and perform a decomposition to measure the program's impact at the extensive and intensive margins. My results suggest that the program decreases the allocation of hours to economic activities and unpaid economic activities and does not affect the allocation of time to any work activity, paid employment, and unpaid household services. The decomposition shows that the extensive margin effect explains these effects on hours. These results suggest that children in beneficiary households do not work fewer hours conditional on participating in the activity; rather, they are less likely to perform that activity.

Finally, I propose a simple theoretical framework of household decision-making that highlights how cash transfers and the child's skills endowment determine parents' decisions concerning children's activities and time allocation. The qualitative results are consistent with the behavior of households observed in the data. The model explains how the interrelation between household resources (affected by an exogenous cash transfer) and child ability affect the optimal determination of household decisions related to schooling and work. The results underline how different transfer designs could change household welfare.

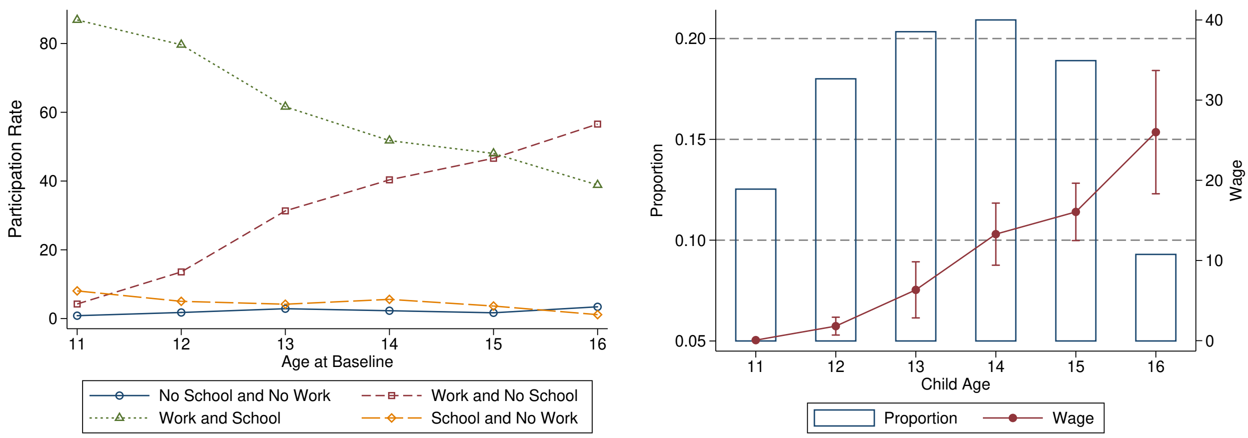
Overall, this paper provides a comprehensive empirical and theoretical framework to understand how government transfer programs affect household decisions regarding children's participation in different activities and contributes to the literature related to child labor, schooling, and behavioral responses of households to transfer programs. The results of this paper emphasize the importance of cash transfer policies for household decisions related to child activities and have important policy implications for the design of cash transfer programs aiming to improve welfare by increasing schooling and mitigating child labor. It should be noted that, throughout this paper, it has been assumed that the two types of child abilities are exogenous. However, malnutrition and poor living conditions could have adverse impacts on children's abilities. Consequently, governments that provide cash transfer programs designed to foster child schooling and mitigate child labor should also consider complementary policies that contribute to the development of different child abilities (e.g., investments in food supply facilities, sanitation infrastructure, schools, and hospitals).

Appendix A. Additional Figures and Tables

Appendix A.1. Descriptive Tables and Plots

Figure A.1: Participation Rates and Wages over Age Profiles

(a) Participation Rate (Any Work Activities) **(b)** Average Wage



Notes: Panel (a) illustrates the participation rate in each child activity at baseline over different ages (11-16 years old) measured at baseline. Panel (b) shows the average wage of children at different ages and the proportion of children in that age bin in the sample (measured at baseline).

Table A.1: Compliance with the Program Assignment

	Lottery (Z)		
	Lose (0)	Won (1)	Total
Treatment Status (T)			
Non-beneficiaries (0)	550	310	860
Beneficiaries (1)	340	683	1,023
Total	890	993	1,883

Notes: The table shows a cross-tabulation of the treatment and lottery status indicators. Each cell of the table reports the number of children in each category. From the table it is possible to calculate the percentage of compliers in the sample by computing: (T=1/Z=1) - (T=1/Z=0) = 68.78%-38.2%=30.58%.

Table A.2: Descriptive Statistics of Household Characteristics by Lottery Status (at baseline)

	Winners[a] (N=993)		Losers[b] (N=890)		Difference (N=1,883)
	Mean	SD	Mean	SD	$a - b$
Household Characteristics					
Child Earnings (USD)	9.85	1.05	9.76	1.13	0.18
Non-Student (%)	0.35	0.02	0.34	0.02	0.00
Child Age	13.43	0.05	13.45	0.05	-0.02
Male Children (%)	0.47	0.02	0.52	0.02	-0.05**
Child Speaks Indigenous Language (%)	0.10	0.01	0.08	0.01	0.02
Child Has Disability (%)	0.01	0.00	0.01	0.00	0.00
Oldest Resident Child (%)	0.65	0.02	0.66	0.02	-0.01
Oldest Girl Child (%)	0.42	0.02	0.39	0.02	0.02
Mother Present (%)	0.94	0.01	0.93	0.01	0.00
Mother's Years of Education	3.70	0.09	3.46	0.10	0.25
Father Present (%)	0.82	0.01	0.83	0.01	-0.01
Rural (%)	0.53	0.02	0.5	0.02	0.04
Number of School Age Children	2.70	0.04	2.6	0.04	0.10
Number of Children 0 to 5	0.51	0.02	0.46	0.02	0.05
Base Log (PC Expenditures)	6.00	0.02	6.01	0.02	-0.01
Household size	6.14	0.06	6.09	0.06	0.04

Notes: The table shows the set of important characteristics of the households used in the analysis. *significant to 10%; **significant to 5%; ***significant to 1%.

Appendix A.2. Model Results: Effect of Transfer Policies

Parameter Values

For the baseline specification, I normalize the autonomous income of the parent (y) to one. I set the schooling cost parameter (c) to 1, producing an effective baseline schooling expenditure of 0.24.[19] Also, this parameterization allows us to express the transfer as a proportional reduction of this cost. I set the child wage rate (w) to 0.35 and the value of the child leisure weight (ψ) to 0.36. Using these set of parameters together with the FOCs, I obtain the value of the market ability (v^w), which is 1.52. These parameters allow me to have a baseline child labor income ($v^w wl = 0.10$) that replicates the fact that median child labor earnings are greater than the transfer.[20] Then, I calibrate the remaining parameters such that the model replicates a given time allocation structure. Specifically, I target child's hours worked in the labor market, schooling and leisure. To be consistent with the data on household decisions at the extensive margin, I assume that if the household chooses to send the child to school, it has to fulfill the 75 percent attendance requirement, which means that at least must allocate 0.18 of their endowment of time to this activity. However, in the case of the lump-sum cash transfer structure, the household receives the transfer always, independent of the attendance requirement.[21]

Table A.3: Model Parameters

Parameter	Description	Moments To Be Matched	Subsidy Scenario		
			Value	Target	Model
α	baseline human capital	Idleness	1.17	0.58	0.58
v^s	school ability	Work	2.17	0.18	0.18
η	human capital productivity	School	1.69	0.24	0.24
v^w	work ability	F.O.C.	1.52	-	-
ψ	leisure weight	Fixed	0.36	-	-
c	cost of schooling	Fixed	1	-	-
w	child wage	Fixed	0.35	-	-
τ^s	subsidy transfer	Fixed	0.35	-	-
τ	lump-sum transfer	Fixed	0.07	-	-

[19]Typically, children spend around 40 hours a week in schooling (since time allocation is normalized to 1 this represents 0.24 in the model). So, the actual schooling cost is $0.24 * 1 = 0.24$ (24 percent of the parental income), consistent with the data.

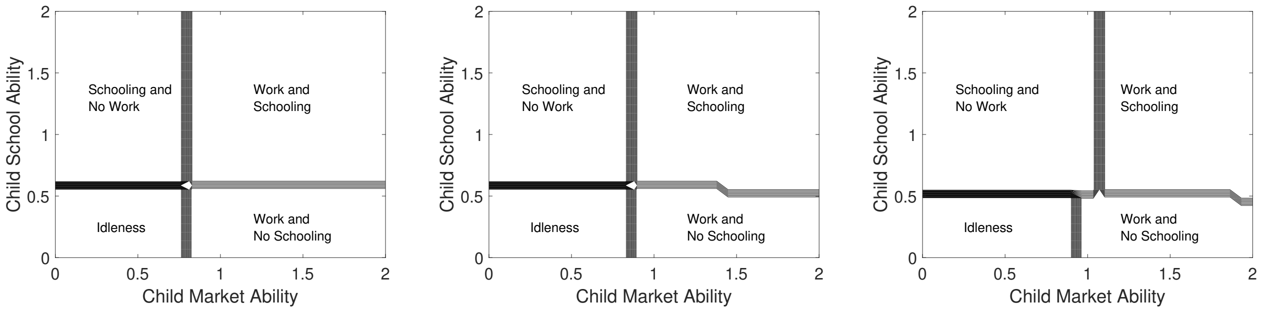
[20]Note that the program was designed for poor women with children, which receive a cash transfer equivalent to 7 percent of monthly expenditures. I impose that in the calibration exercise as the benchmark transfer.

[21]Although the household receives the lump-sum transfer independent of the attendance requirement, I assume that if the household decides to send the child to school, the child must attend at least 75 percent to maintain an active status and avoid being expelled from the school.

Figure A.2: Discrete Choice Comparative Statics

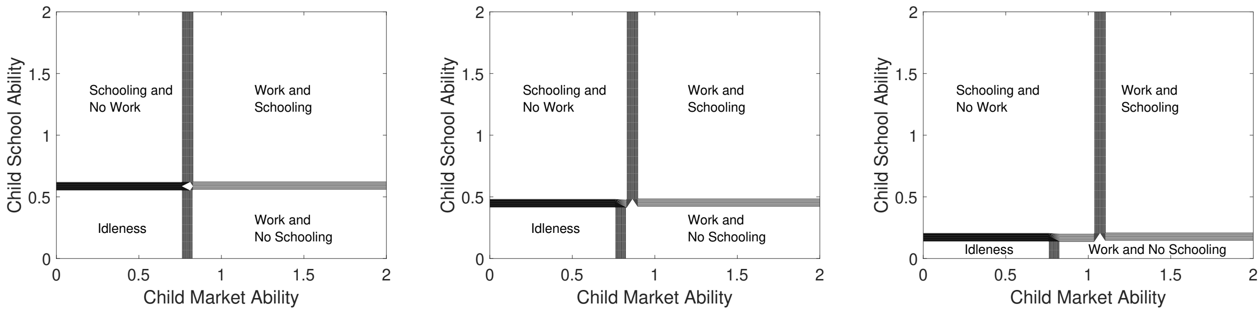
Panel A: Lump-Sum Cash Transfer Scenario

(a) No Transfer **(b)** Transfer: 7% of HH Income **(c)** Transfer: Full



Panel B: Subsidy Cash Transfer Scenario

(d) No Transfer **(e)** Transfer: 7% of HH Income **(f)** Transfer: Full

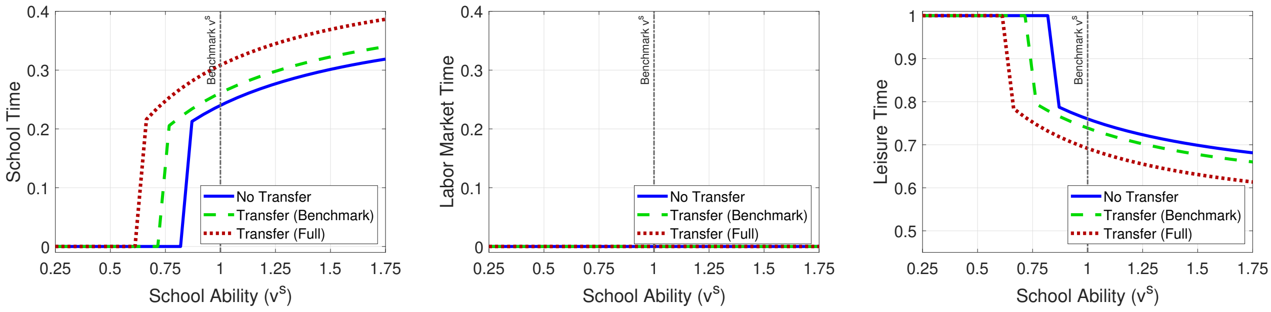


Notes: The figure illustrates how equilibrium household decisions regarding child activities react to different transfer structures. These calculations come from solving the model under the parametric values assigned in Table A.3.

Figure A.3: Effect of the Lump-Sum Cash Transfer on Child Activities

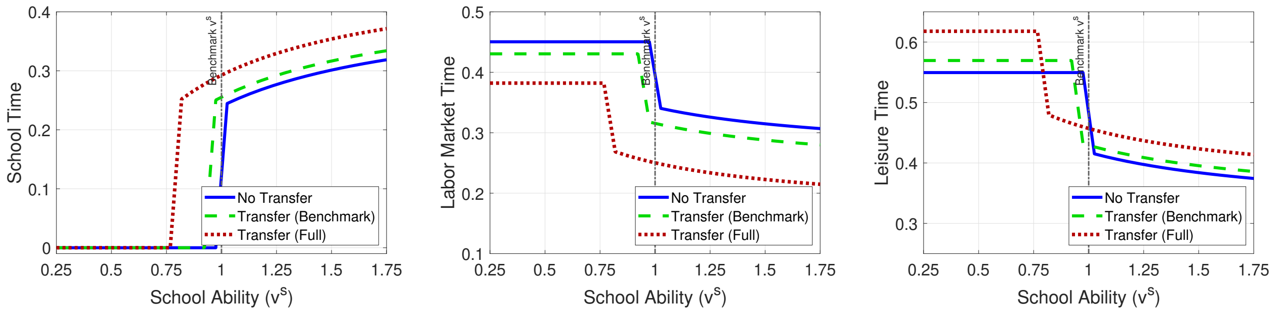
Panel A: Scenario with Low Market Ability

(a) Schooling **(b)** Labor Market **(c)** Leisure



Panel B: Scenario with High Market Ability

(d) Schooling **(e)** Labor Market **(f)** Leisure

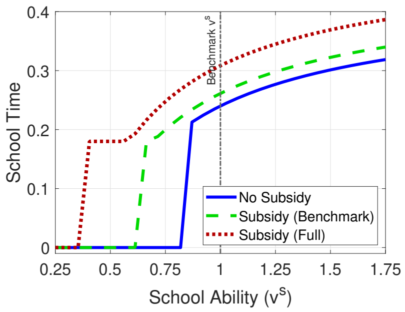


Notes: The solid blue line represents a no-transfer scenario. The green dashed line represents the benchmark cash transfer scenario. The red dotted line represents a transfer scenario covering full schooling costs. The top panels show a scenario where the child is endowed with low market ability. The bottom panels portray a situation where the child is endowed with high market ability. These calculations come from solving the model under the parametric values assigned in Table A.3.

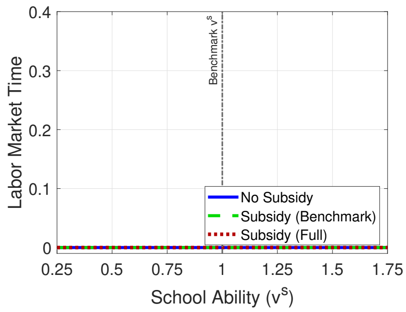
Figure A.4: Effect of the Subsidy Cash Transfer on Child Activities

Panel A: Scenario with Low Market Ability

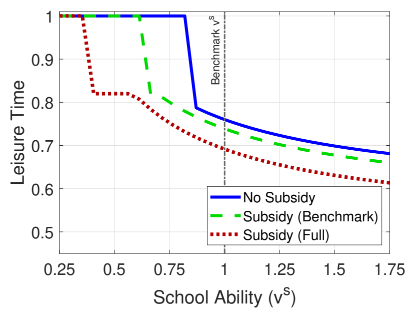
(a) Schooling



(b) Labor Market

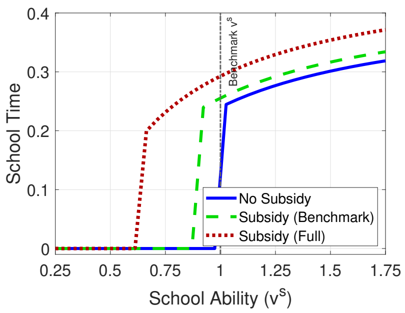


(c) Leisure

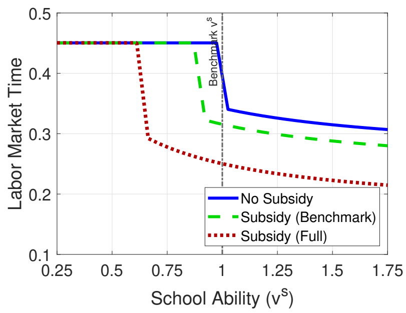


Panel B: Scenario with High Market Ability

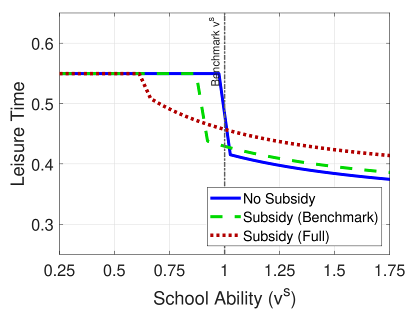
(d) Schooling



(e) Labor Market



(f) Leisure



Notes: The solid blue line represents a no-transfer scenario. The green dashed line represents the benchmark cash transfer scenario. The red dotted line represents a transfer scenario covering full schooling costs. The top panels show a scenario where the child is endowed with low market ability. The bottom panels portray a situation where the child is endowed with high market ability. These calculations come from solving the model under the parametric values assigned in Table A.3.

Appendix B. Supplementary Material

Appendix B.1. LATE Decomposition into Intensive and Extensive Margins

Following a similar procedure as the one used in Equation (6), it is possible to decompose a local average treatment effect (LATE) into its extensive and intensive margin. We know that LATE is defined as:

$$\frac{\mathbb{E}\left[Hours \mid Z=1\right]-\mathbb{E}\left[Hours \mid Z=0\right]}{\mathbb{E}\left[T \mid Z=1\right]-\mathbb{E}\left[T \mid Z=0\right]} \tag{B.1}$$

We can express the numerator as:

$$
\begin{aligned}
&\underbrace{\mathbb{E}\left[Hours \mid Z=1\right]-\mathbb{E}\left[Hours \mid Z=0\right]}_{ITT\ for\ hours}\\
&=\underbrace{\left(\mathbb{E}\left[Hours \mid Z=1, Work=1\right]-\mathbb{E}\left[Hours \mid Z=0, Work=1\right]\right)}_{ITT\ for\ hours \mid employment}\cdot\underbrace{Pr\left[Work=1 \mid Z=1\right]}_{Lottery\ winners\ employment\ rate}\\
&+\underbrace{\mathbb{E}\left[Hours \mid Z=0, Work=1\right]}_{Lottery\ losers\ earnings \mid employment}\cdot\underbrace{\left(Pr\left[Work=1 \mid Z=1\right]-Pr\left[Work=1 \mid Z=0\right]\right)}_{ITT\ for\ employment}
\end{aligned}
\tag{B.2}
$$

Then we can rewrite the LATE as:

$$
\begin{aligned}
&\underbrace{\frac{\mathbb{E}\left[Hours \mid Z=1\right]-\mathbb{E}\left[Hours \mid Z=0\right]}{\mathbb{E}\left[T \mid Z=1\right]-\mathbb{E}\left[T \mid Z=0\right]}}_{LATE\ for\ hours}\\
&=\underbrace{\left(\frac{\mathbb{E}\left[Hours \mid Z=1, Work=1\right]-\mathbb{E}\left[Hours \mid Z=0, Work=1\right]}{\mathbb{E}\left[T \mid Z=1\right]-\mathbb{E}\left[T \mid Z=0\right]}\right)}_{LATE\ for\ hours \mid employment}\cdot\underbrace{Pr\left[Work=1 \mid Z=1\right]}_{Lottery\ winners\ employment\ rate}\\
&+\underbrace{\mathbb{E}\left[Hours \mid Z=0, Work=1\right]}_{Lottery\ losers\ earnings \mid employment}\cdot\underbrace{\left(\frac{Pr\left[Work=1 \mid Z=1\right]-Pr\left[Work=1 \mid Z=0\right]}{\mathbb{E}\left[T \mid Z=1\right]-\mathbb{E}\left[T \mid Z=0\right]}\right)}_{LATE\ for\ employment}
\end{aligned}
\tag{B.3}
$$

On the right-hand side of Equation B.3, the first line represents the intensive margin effect, whereas the second line represents the extensive margin effect. The intensive margin effect on hours is the LATE on hours minus the extensive margin effect. In this equation, the only term that is not identified is the LATE on hours conditional on employment. Therefore, this term can be consistently estimated using this equation. I construct a program that implements this computation estimating all expressions as a system and bootstrapping the standard errors for inference purposes.

Appendix B.2. Additional Models Including Very Young Children

Table B.1: Marginal Effects of the Impact of the CT Program on Household Decisions over Child Activities

	No School and No Work		Work and No School		Work and School		School and No Work	
P(choice)	0.029	0.021	0.245	0.182	0.631	0.724	0.095	0.073
dP/dCT								
ITT	0.002	0.000	-0.032**	-0.038***	0.019	0.026	0.010	0.012
	(0.007)	(0.006)	(0.016)	(0.014)	(0.020)	(0.019)	(0.013)	(0.012)
	No School and No Work		Work and No School		Work and School		School and No Work	
P(choice)	0.029	0.021	0.244	0.181	0.632	0.725	0.095	0.073
dP/dCT								
LATE	0.007	-0.000	-0.110*	-0.132***	0.063	0.088	0.040	0.044
	(0.032)	(0.026)	(0.058)	(0.051)	(0.075)	(0.073)	(0.044)	(0.040)
Controls	×	✓	×	✓	×	✓	×	✓

Notes: The table shows the estimated marginal effect of being eligible for the CT program (ITT) as well as receiving the CT program (LATE) on the household decision related to child activities. For each row, odd-numbered columns contain the results of a model without controls, whereas even-numbered columns contain the results of the model with controls. The sample includes children five years and older. The treatment effects are measured as the probability change of choosing a particular option. Including covariates are: age of the child (in years), gender, household size, family composition, presence of parents, log per capita expenditures, an indicator for rural area, an indicator if the household head is male, and an indicator if the child speaks an indigenous language. Standard errors in parenthesis are adjusted for 79 parish clusters and bootstrapped with 500 replications. The sample size is 2,997 observations. *significant to 10%; **significant to 5%; ***significant to 1%.

Table B.2: Marginal Effects of the Impact of the CT Program on Household Decisions over Boys and Girls Activities

	No School and No Work		Work and No School		Work and School		School and No Work	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
P(choice)	0.018	0.021	0.159	0.204	0.722	0.726	0.102	0.048
dP/dCT								
ITT	0.002	-0.004	-0.034**	-0.042**	0.003	0.051**	0.029	-0.004
	(0.008)	(0.011)	(0.017)	(0.021)	(0.024)	(0.023)	(0.019)	(0.011)

	No School and No Work		Work and No School		Work and School		School and No Work	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
P(choice)	0.018	0.021	0.158	0.204	0.724	0.727	0.101	0.048
dP/dCT								
LATE	0.008	-0.015	-0.112**	-0.161**	0.003	0.186*	0.101	0.010
	(0.033)	(0.078)	(0.057)	(0.071)	(0.083)	(0.096)	(0.061)	(0.043)
Controls	✓	✓	✓	✓	✓	✓	✓	✓

Notes: The table shows the estimated marginal effect of being eligible for the CT program (ITT) as well as receiving the CT program (LATE) on the household decision related to boys and girls activities. For each row, odd-numbered columns contain the results of the model for boys, whereas even-numbered columns contain the results of the model for girls. The sample includes children five years and older. The treatment effects are measured as the probability change of choosing a particular option. Including covariates are: age of the child (in years), household size, family composition, presence of parents, log per capita expenditures, an indicator for rural area, an indicator if the household head is male, and an indicator if the child speaks an indigenous language. Standard errors in parenthesis are adjusted for 79 parish clusters and bootstrapped with 500 replications. The sample size is 1,502 observations for boys and 1,495 observations for girls. *significant to 10%; **significant to 5%; ***significant to 1%.

Table B.3: Marginal Effects of the Impact of the CT Program on Household Decisions over Child Activities (Extended)

	No School No Work	No School Eco. Activ.	No School HH Chores	No School All Work	School Eco. Activ.	School HH Chores	School All Work	School No Work
P(choice)	0.025	0.019	0.037	0.114	0.059	0.351	0.315	0.079
dP/dCT								
ITT	0.000	-0.021**	-0.010	-0.006	-0.009	0.056***	-0.021	0.011
	(0.006)	(0.008)	(0.009)	(0.011)	(0.009)	(0.017)	(0.018)	(0.012)
	No School No Work	No School Eco. Activ.	No School HH Chores	No School All Work	School Eco. Activ.	School HH Chores	School All Work	School No Work
P(choice)	0.025	0.019	0.037	0.114	0.059	0.352	0.315	0.079
dP/dCT								
LATE	0.001	-0.080**	-0.031	-0.022	-0.029	0.188***	-0.069	0.042
	(0.027)	(0.040)	(0.039)	(0.033)	(0.031)	(0.061)	(0.059)	(0.036)
Controls	✓	✓	✓	✓	✓	✓	✓	✓

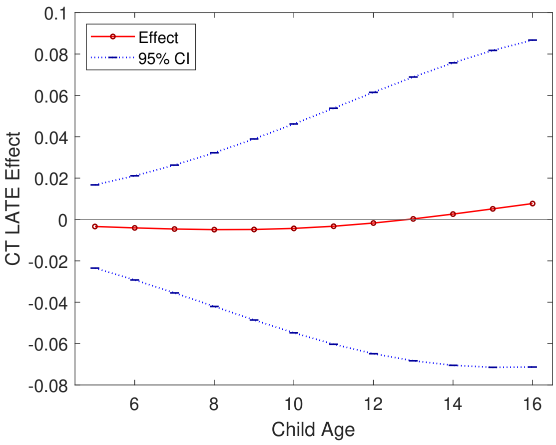
Notes: The table shows the estimated marginal effect of being eligible for the CT program (ITT) as well as receiving the CT program (LATE) on the household decision related to child activities. The sample includes children five years and older. The treatment effects are measured as the probability change of choosing a particular option. Including covariates are: age of the child (in years), gender, household size, family composition, presence of parents, log per capita expenditures, an indicator for rural area, an indicator if the household head is male, and an indicator if the child speaks an indigenous language. Standard errors in parenthesis are adjusted for 79 parish clusters and bootstrapped with 500 replications. The sample size is 2,997 observations. *significant to 10%; **significant to 5%; ***significant to 1%.

Appendix B.3. Heterogeneous Effects over Age

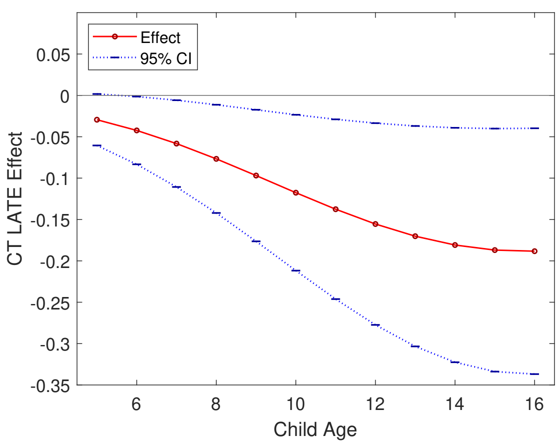
I also explored heterogeneity of the policy by child age to understand if the transfer shifts the decisions of the household regarding child activities contingent on the age of the child. To further understand the behavior of households when they receive a cash transfer, I estimate these effects using children between 5 and 16 years old. The evidence suggests that the effects of the transfer are stable across age profiles (11-16). We can observe that the cash transfer has a larger effect in shifting the decision of only sending the child to work when the child is older. Regarding the combination of child labor and schooling, the cash transfer increases the likelihood that the household chooses this option when the child is older. Finally, the cash transfer does not have a statistically significant effect, at any age profile, on the option idleness, and in the case of choosing exclusively schooling, the transfer only has a slightly significant effect when the child is old.

Figure B.1: Heterogeneous Effects over Age (5-16)

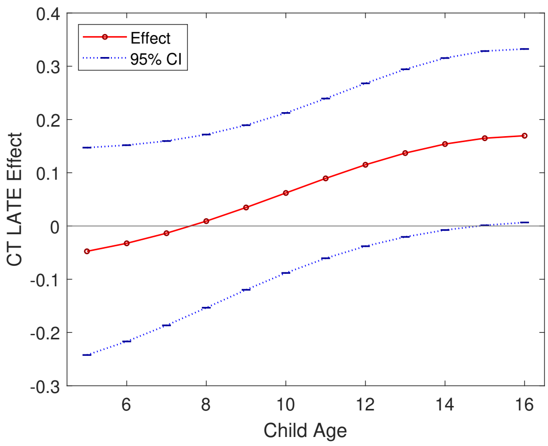
(a) No Work No School



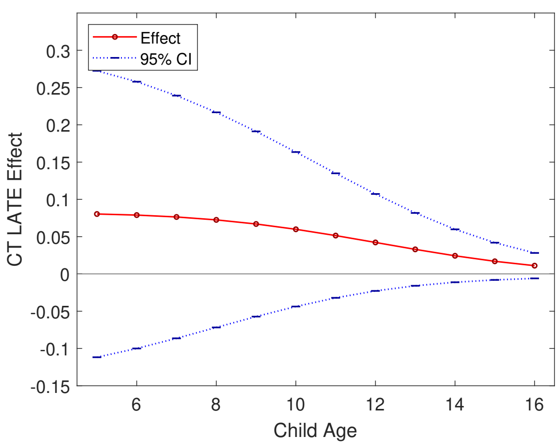
(b) Work and No School



(c) Work and School



(d) School and No Work



Notes: Each panel shows the estimated marginal effect of receiving the CT program (LATE) on the household decision related to child activities over different age profiles (red solid line). The sample includes children five years and older. The treatment effects are measured as the probability change of choosing a particular option. Including covariates are: age of the child (in years), gender, household size, family composition, presence of parents, log per capita expenditures, an indicator for rural area, an indicator if the household head is male, and an indicator if the child speaks an indigenous language. 95% confidence intervals are adjusted for 78 parish clusters and bootstrapped with 500 replications (blue dashed line).

Appendix B.4. Derivations of Comparative Statics

Effect of Subsidy Cash Transfer

To analyze the impact of the subsidy transfer policy on schooling, set $\tau = 0$, and total differentiate Equation (11) with respect to τ^s:

$$U_{qq}\left(c-\tau^s\right)^2 ds - U_{qq}\left(c-\tau^s\right) s d\tau^s + U_q d\tau^s + U_{QQ} Q_s^2 ds + U_Q Q_{ss} ds + U_{hh} ds = 0 \tag{B.4}$$

Collecting terms we have:

$$\left[U_{qq}\left(c-\tau^s\right)^2 + U_{QQ}Q_s^2 + U_Q Q_{ss} + U_{hh}\right] ds = \left[U_{qq}\left(c-\tau^s\right) s - U_q\right] d\tau^s \tag{B.5}$$

Therefore:

$$\frac{ds}{d\tau^s} = \frac{U_{qq}\left(c-\tau^s\right) s - U_q}{U_{qq}\left(c-\tau^s\right)^2 + U_{QQ}Q_s^2 + U_Q Q_{ss} + U_{hh}} \tag{B.6}$$

Quasiconcavity of the utility function implies that $U_{jj} < 0$ for $j \in \{q, Q, h\}$. Also by assumption $Q_s > 0$ and $Q_{ss} \leq 0$. It follows that the numerator and denominator of B.6 are both non-positive. Therefore, $\frac{ds}{d\tau^s} \geq 0$.

Now, to analyze the impact of the subsidy transfer policy on labor, set $\tau = 0$, and total differentiate Equation (12) with respect to τ^s:

$$U_{qq}\left(v^w w\right)^2 dl + U_{qq}\left(v^w w\right) s d\tau^s + U_{hh} dl = 0 \tag{B.7}$$

Therefore,

$$\frac{dl}{d\tau^s} = \frac{-U_{qq}\left(v^w w\right) s}{U_{qq}\left(v^w w\right)^2 + U_{hh}} \tag{B.8}$$

Quasiconcavity of the utility function implies that $U_{jj} < 0$ for $j \in \{q, h\}$. It follows that the numerator of B.8 is non-negative whereas the denominator is non-positive. Therefore, $\frac{dl}{d\tau^s} \leq 0$.

Effect of Lump-Sum Cash Transfer

To analyze the impact of the subsidy transfer policy on schooling, set $\tau^s = 0$, and total differentiate Equation (11) with respect to τ:

$$U_{qq}c^2 ds - U_{qq} c d\tau + U_{QQ}Q_s^2 ds + U_Q Q_{ss} ds + U_{hh} ds = 0 \tag{B.9}$$

Collecting terms we have:

$$\left[U_{qq}c^2 + U_{QQ}Q_s^2 + U_Q Q_{ss} + U_{hh}\right] ds = \left[U_{qq}c\right] d\tau \tag{B.10}$$

Therefore:

$$\frac{ds}{d\tau} = \frac{U_{qq}c}{U_{qq}c^2 + U_{QQ}Q_s^2 + U_Q Q_{ss} + U_{hh}} \tag{B.11}$$

Quasiconcavity of the utility function implies that $U_{jj} < 0$ for $j \in \{q, Q, h\}$. Also by assumption $Q_s > 0$ and $Q_{ss} \leq 0$. It follows that the numerator and denominator of B.11 are both non-positive. Therefore, $\frac{ds}{d\tau} \geq 0$.

Now, to analyze the impact of the lump-sum transfer policy on labor, set $\tau^s = 0$, and total differentiate Equation (12) with respect to τ:

$$U_{qq} (v^w w)^2 \, dl + U_{qq} (v^w w) \, d\tau + U_{hh} dl = 0 \tag{B.12}$$

Therefore,

$$\frac{dl}{d\tau} = \frac{-U_{qq} (v^w w)}{U_{qq} (v^w w)^2 + U_{hh}} \tag{B.13}$$

Quasiconcavity of the utility function implies that $U_{jj} < 0$ for $j \in \{q, h\}$. It follows that the numerator of B.13 is non-negative whereas the denominator is non-positive. Therefore, $\frac{dl}{d\tau} \leq 0$.

Appendix B.5. Characterization of the Scenarios for Child Activities

Case 1: No school no work ($h = 1$, $s = 0$, $l = 0$)

This case implies that $\lambda = 0$, $\mu > 0$, and $\phi > 0$. Since $s = 0$ and $h = 1 > 0$, then Equation (16) holds with equality whereas Equation (17) holds with inequality. Therefore, the FOCs have to satisfy:

$$U_Q Q_s < U_q (c - \tau^s) + U_h \tag{B.14}$$

$$U_h > U_q (v^w w) \tag{B.15}$$

This situation occurs when: (i) the marginal benefit from schooling is less than its marginal cost, and (ii) the marginal utility from leisure outweighs the opportunity cost of leisure that comes from forgone labor income. As a result, households with children that have low educational returns (low school ability) and bad labor market opportunities (low market ability) are more likely to choose idleness for their children.

Case 2: Work and no schooling ($h > 0$, $s = 0$, $l > 0$)

This case implies that $\lambda = 0$, $\mu = 0$, and $\phi = 0$. Since $s = 0$ and $h > 0$, then Equation (16) holds with equality while Equation (17) holds with inequality. Therefore, the FOCs have to satisfy:

$$U_Q Q_s < U_q (v^w w + c - \tau^s) \tag{B.16}$$

$$U_h = U_q (v^w w) \tag{B.17}$$

This situation arises when: (i) the marginal benefit from schooling is less than its marginal cost, and (ii) the marginal utility from leisure is equal to the opportunity cost of leisure resulting from the forgone labor income. As a result, households with children that have low educational returns (low school ability) and good labor market opportunities (high market ability) are more likely to choose work and no schooling for their children.

Case 3: Work and schooling ($h > 0$, $s > 0$, $l > 0$)

This case implies that $\lambda = 0$, $\mu = 0$, and $\phi = 0$. Since $s > 0$ and $h > 0$, then Equations (16) and (17) both hold with equality. Therefore, the FOCs have to satisfy:

$$U_Q Q_s = U_q \left(v^w w + c - \tau^s\right) \tag{B.18}$$

$$U_h = U_q \left(v^w w\right) \tag{B.19}$$

This case represents an interior solution and occurs when: (i) the marginal return from schooling is equal to its marginal cost, and (ii) the marginal utility from leisure is equal to the opportunity cost of leisure that comes from forgone labor income.

Case 4: Schooling and no work ($h > 0$, $s > 0$, $l = 0$)

This case implies that $\lambda = 0$, $\mu = 0$, and $\phi > 0$. Since $s > 0$ and $h > 0$, then Equation (16) and (17) hold with equality. Therefore, the FOCs have to satisfy:

$$U_Q Q_s > U_q \left(v^w w + c - \tau^s\right) \tag{B.20}$$

$$U_h > U_q \left(v^w w\right) \tag{B.21}$$

This situation arises when: (i) the marginal benefit from schooling is higher than its marginal cost, and (ii) the marginal utility from leisure is higher than the opportunity cost of leisure resulting from the forgone labor income. As a result, households with children that have high educational returns (high school ability) and bad labor market opportunities (low market ability) are more likely to choose schooling and no work for their children.

Partitioning of Parameter Space

Using Equations (21) and (22) together with Equations (18), (19) and (20) allows one to characterize four different scenarios: no school no work–idleness, work and no schooling, work and schooling and schooling and no work.

Case 1: No school no work ($h = 1$, $s = 0$, $l = 0$)

This case implies that $\lambda = 0$, $\mu > 0$, and $\phi > 0$. Since $s = 0$ and $h = 1 > 0$, then Equation (21) holds with equality whereas Equation (22) holds with inequality. Therefore, the FOCs have to satisfy:

$$\frac{\eta v^s}{\alpha} < \frac{v^w w + (c - \tau^s)}{y + \tau} + \phi \tag{B.22}$$

$$\psi = \frac{v^w w}{y + \tau} + \mu + \phi \tag{B.23}$$

Equations (B.22) and (B.23) imply that for this case, the parameters have to satisfy:

$$y > \frac{v^w w}{\psi} - \tau \tag{B.24}$$

$$y < \frac{\alpha (c - \tau^s)}{\eta v^s - \psi \alpha} - \tau \tag{B.25}$$

Case 2: Work and no schooling ($h > 0$, $s = 0$, $l > 0$)

This case implies that $\lambda = 0$, $\mu = 0$, and $\phi = 0$. Since $s = 0$ and $h > 0$, then Equation (21) holds with equality while Equation (22) holds with inequality. Therefore, the FOCs have to satisfy:

$$\frac{\eta v^s}{\alpha} < \frac{v^w w + (c - \tau^s)}{y + v^w w - v^w w h + \tau} \tag{B.26}$$

$$\frac{\psi}{h} = \frac{v^w w}{y + v^w w - v^w w h + \tau} \tag{B.27}$$

Given that $l > 0$ and $h > 0$, $l + h = 1$, then $h < 1$. Therefore, from Equation (B.26) and (B.27) the range of parameters for this case are:

$$y < \frac{v^w w}{\psi} - \tau \tag{B.28}$$

$$v^s < \frac{(v^w w + (c - \tau^s))(1 + \psi)\alpha}{\eta (y + v^w w) + \tau} \tag{B.29}$$

Case 3: Work and schooling ($h > 0$, $s > 0$, $l > 0$)

This case implies that $\lambda = 0$, $\mu = 0$, and $\phi = 0$. Since $s > 0$ and $h > 0$, then Equations (21) and (22) both hold with equality. Therefore, the FOCs have to satisfy:

$$\frac{\eta v^s}{\alpha + \eta s v^s} = \frac{v^w w + (c - \tau^s)}{y + v^w w - s(v^w w + (c - \tau^s)) - v^w w h + \tau} \tag{B.30}$$

$$\frac{\psi}{h} = \frac{v^w w}{y + v^w w - s(v^w w + (c - \tau^s)) - v^w w h + \tau} \tag{B.31}$$

Using Equations (B.30) and (B.31), I can characterize s and h as:

$$s = \frac{y + v^w w + \tau}{(v^w w + (c - \tau^s))(2 + \psi)} - \frac{(1 + \psi)\alpha}{\eta v^s (2 + \psi)} \tag{B.32}$$

$$h = \frac{(y + v^w w + \tau)\psi}{v^w w (2 + \psi)} + \frac{\psi (v^w w + (c - \tau^s))\alpha}{v^w w (2 + \psi)\eta v^s} \tag{B.33}$$

In order for $l > 0$, we need $s + h < 1$. Therefore, using Equations (B.32) and (B.33), the parametric restrictions for this case is given by:

$$y < \frac{\left[(v^w w)^2 + 2 v^w w c - \tau (v^w w (\psi - 1) - \psi (c - \tau^s))\right]}{\left[\psi (v^w w + (c - \tau^s)) + v^w w\right]} + \frac{\alpha \left[(v^w w - \psi (c - \tau^s))(v^w w + (c - \tau^s))\right]}{\left[\psi (v^w w + (c - \tau^s)) + v^w w\right]\eta v^s} \tag{B.34}$$

Case 4: Schooling and no work ($h > 0$, $s > 0$, $l = 0$)

This case implies that $\lambda = 0$, $\mu = 0$, and $\phi > 0$. Since $s > 0$ and $h > 0$, then Equation (21) and (22) hold with equality. This represents the residual area obtained after taking into consideration the other three cases.

Appendix B.6. Extension of the Model to Explore Additional Mechanisms

To take into consideration additional mechanisms, I examine an economy in which a large number of identical agents are born in each period and live for two periods, first as children, then as parents. To illustrate how a government cash transfer funded by labor income taxes affects household decisions regarding child activities, I develop a simple overlapping generations model incorporating parental altruism. The main suggestion of this model is that the success of cash transfer programs in changing household decisions regarding child activities depends on a combination of factors such as: the magnitude of the income and substitution effects produced by the cash transfer, the child endowment of market and school abilities, the households relative income, the share of beneficiary households in the economy, the household preferences, the average income from labor in the economy and the tax rates.

Model Setup

Each household is formed by two agents: one parent and one child. The economy has an overlapping generations structure in which each agent lives for two periods: as a child and as an adult. Suppose a continuum of agents with unit mass in each generation. In the second period, each agent reproduces and creates another agent. Therefore, there is a constant population over time. In this framework, the parent makes all the decisions. The child is endowed with one unit of time that can be allocated between school (s), the labor market (l), and leisure (h). The parent is also endowed with one unit of time that can allocate to the labor market $(1 - z_t)$ and leisure. The household has a unitary structure and the parent has to decide how much time the child allocates to these three activities. The household derives utility from a consumption good purchased in the market, denoted by q, the human capital of the child, denoted by Q_{t+1}, the leisure time of the child, denoted by h_t, and from the parent leisure time, denoted by z_t. Let's denote the household utility function by:

$$U_t(q_t, Q_{t+1}, h_t, z_t) = \log(q) + \beta \log(Q_{t+1}) + \psi \log(h_t) + \alpha \log(z_t) \tag{B.35}$$

where $\beta > 0$ is the parental preference for the child's human capital, $\psi > 0$ is the parental preference for child leisure, and $\alpha > 0$ is the parental preference for her leisure. When the parent allocates $(1 - z_t)$ units of time to the labor market, she earns after-tax labor income $\left(1 - \tau^l\right)(1 - z_t)\, Q_t$, where Q_t is her human capital (or labor income per unit of time) and $\tau^l \in (0, 1)$ is the labor income tax rate.

As before, I follow Belzil and Hansen (2002) and allow the child to be endowed with some combination of market ability (v^w) and school ability (v^s), so that the combination of the two will determine how much human capital the child accumulates, and how much the child can earn in the labor market upon entering the workforce. Allocating time to schooling is costly. Schooling has a cost $c > 0$ proportional to the time allocated to this activity. On the other hand, if a child with market ability v^w, allocates a fraction l_t of his time to the labor market, the child earns a wage per unit of time worked, which is given by $v^w w$. To have a general framework, the transfers could be interpreted in two ways: as a subsidy of the human capital input, denoted by τ^s, or as lump-sum cash transfer, denoted by τ. Furthermore, because the government focuses on providing cash transfers to low-income households, I assume that each parent would get the same amount of government assistance τ (or τ^s) if the parent's labor income $Y_t = (1 - z_t) Q_t$ is less than the labor income threshold $\hat{Y}_t$, where $\hat{Y}_t \leq \overline{Y}_t$ and $\overline{Y}_t = (1 - z_t) \overline{Q}_t$ is the average income from labor in the economy. In this context, the household budget constrain is given by:

$$q_t + (c - \tau^s) s_t = \left(1 - \tau^l\right) (1 - z_t) Q_t + v^w w l Q_t + \tau \tag{B.36}$$

If a child with school ability v^s, allocates a fraction s_t of her time to education, the amount of human capital accumulated is given by:

$$Q_{t+1} (s, v^s, Q_t) = \eta v^s s_t Q_t \tag{B.37}$$

where ηv^s represents the child's human capital productivity. Equation (B.37), characterizes the child's stock of human capital as a function of the human capital productivity ηv^s, the parent's stock of human capital Q_t, and the allocation of time to schooling activities s_t.

Finally, there is a government that maintains a balanced budget using transfers and labor income taxes:

$$\tau^l \overline{Y}_t = \lambda_\tau \tau + \lambda_{\tau^s} \tau^s \theta s_t \tag{B.38}$$

where $0 < \lambda_\tau < 1$ and $0 < \lambda_{\tau^s} < 1$, are constant fractions of low-income households in the economy where their labor income, Y_t, satisfies the condition that $Y_t < \hat{Y}_t \leq \bar{Y}_t$. In the scenario of a subsidy cash transfer, the parameter $\theta \in (0, 1)$ in the government budget balance equation measure the share of time allocated to schooling that the government is willing to subsidize.

Household's Optimization

The household has to decide the amount of consumption, the child's human capital, the child's leisure, and the parent's leisure. Given the policy triplet $\left(\tau^l, \tau^s, \tau\right)$, the household solves the following problem:

$$\begin{aligned} \max_{q_t, Q_t, h_t, z_t} \quad & U_t (q_t, Q_{t+1}, h_t, z_t) \\ \text{subject to :} \quad & \\ & q_t + (c - \tau^s) s_t = \left(1 - \tau^l\right) (1 - z_t) Q_t + v^w w l_t Q_t + \tau \\ & Q_{t+1} (s, v^s, Q_t) = \eta v^s s_t Q_t \\ & s_t + l_t + h_t = 1 \\ & s_t > 0, l_t > 0, h_t > 0 \\ & \tau^l \overline{Y}_t = \lambda_\tau \tau + \lambda_{\tau^s} \tau^s \theta s_t \end{aligned} \tag{B.39}$$

In reality, governments implement either a lump-sum cash transfer or a subsidy cash transfer. Therefore, we are going to analyze two scenarios: one with only a lump-sum cash transfers, that is, $\tau > 0$ and $\tau^s = 0$, and the other with only a subsidy cash transfer, that is, $\tau = 0$ and $\tau^s > 0$.

Lump-Sum Transfer. In this scenario, the household's optimization problem gives the following optimal conditions:

$$h_t = \frac{\psi\left[(1+v^w w)\lambda_\tau Q_t + \tau^l\left(\bar{Y}_t - \lambda_\tau Q_t\right)\right]}{Q_t\lambda_\tau v^w w(1+\beta+\psi+\alpha)} \tag{B.40}$$

$$s_t = \frac{\beta\left[(1+v^w w)\lambda_\tau Q_t + \tau^l\left(\bar{Y}_t - \lambda_\tau Q_t\right)\right]}{\lambda_\tau(c+Q_t v^w w)(1+\beta+\psi+\alpha)} \tag{B.41}$$

$$z_t = \frac{-\alpha\left[(1+v^w w)\lambda_\tau Q_t + \tau^l\left(\bar{Y}_t - \lambda_\tau Q_t\right)\right]}{Q_t\lambda_\tau(\tau^l-1)(1+\beta+\psi+\alpha)} \tag{B.42}$$

$$q_t = \frac{\left[(1+v^w w)\lambda_\tau Q_t + \tau^l\left(\bar{Y}_t - \lambda_\tau Q_t\right)\right]}{\lambda_\tau(1+\beta+\psi+\alpha)} \tag{B.43}$$

To analyze the impact of the lump-sum cash transfer on the outcomes of interest, we can take the partial derivative of Equations (B.40) and (B.43) with respect to τ^l and to obtain the comparative static results:

$$\frac{\partial h_t}{\partial \tau^l} = \frac{\psi\left(\bar{Y}_t - \lambda_\tau Q_t\right)}{Q_t\lambda_\tau v^w w(1+\beta+\psi+\alpha)} \tag{B.44}$$

$$\frac{\partial s_t}{\partial \tau^l} = \frac{\beta\left(\bar{Y}_t - \lambda_\tau Q_t\right)}{\lambda_\tau(c+Q_t v^w w)(1+\beta+\psi+\alpha)} \tag{B.45}$$

$$\frac{\partial q_t}{\partial \tau^l} = \frac{\left(\bar{Y}_t - \lambda_\tau Q_t\right)}{\lambda_\tau(1+\beta+\psi+\alpha)} \tag{B.46}$$

$$\frac{\partial z_t}{\partial \tau^l} = \frac{\alpha\left(\bar{Y}_t + \lambda_\tau Q_t v^w w\right)}{Q_t\lambda_\tau(\tau^l-1)^2(1+\beta+\psi+\alpha)} \tag{B.47}$$

Equations (B.44) and (B.46) demonstrate that the sign of the effect of the cash transfer on child time allocation and household consumption depends on the relationship between the income effect and the substitution effect of government transfer, that is, if $\bar{Y}_t - \lambda_\tau Q_t \gtreqless 0$. In relation to the allocation of time of the parent, Equations (B.47) shows that an increase in the cash transfer is associated with an increase in parent's leisure.

Subsidy Transfer. In this scenario, the household's optimization problem gives the following optimal conditions:

$$h_t = \frac{\psi\left[(1+v^w w)\theta\lambda_{\tau^s} Q_t + \tau^l\left(\bar{Y}_t - \theta\lambda_{\tau^s} Q_t\right)\right]}{Q_t\theta\lambda_{\tau^s} v^w w(1+\beta+\psi+\alpha)} \tag{B.48}$$

$$s_t = \frac{\beta\left[(1+v^w w)\,\theta\lambda_{\tau^s}Q_t + \tau^l\left(\bar{Y}_t - \theta\lambda_{\tau^s}Q_t\right)\right]}{\lambda_\tau\,(c+Q_t v^w w)\,(1+\beta+\psi+\alpha)} \tag{B.49}$$

$$z_t = \frac{-\alpha\left[(1+v^w w)\,\theta\lambda_{\tau^s}Q_t + \tau^l\left(\bar{Y}_t - \theta\lambda_{\tau^s}Q_t\right)\right]}{Q_t\theta\lambda_{\tau^s}\,(\tau^l-1)\,(1+\beta+\psi+\alpha)} \tag{B.50}$$

$$q_t = \frac{\left[(1+v^w w)\,\theta\lambda_{\tau^s}Q_t + \tau^l\left(\bar{Y}_t - \theta\lambda_{\tau^s}Q_t\right)\right]}{\theta\lambda_{\tau^s}\,(1+\beta+\psi+\alpha)} \tag{B.51}$$

To analyze the impact of the subsidy cash transfer on the outcomes of interest, we can take the partial derivative of Equations (B.48) and (B.51) with respect to τ^l and to obtain the comparative static results.

$$\frac{\partial h_t}{\partial \tau^l} = \frac{\psi\left(\bar{Y}_t - \theta\lambda_{\tau^s}Q_t\right)}{Q_t\theta\lambda_{\tau^s}v^w w\,(1+\beta+\psi+\alpha)} \tag{B.52}$$

$$\frac{\partial s_t}{\partial \tau^l} = \frac{\beta\left(\bar{Y}_t - \theta\lambda_{\tau^s}Q_t\right)}{\theta\lambda_{\tau^s}\,(c+Q_t v^w w)\,(1+\beta+\psi+\alpha)} \tag{B.53}$$

$$\frac{\partial c_t}{\partial \tau^l} = \frac{\left(\bar{Y}_t - \theta\lambda_{\tau^s}Q_t\right)}{\theta\lambda_{\tau^s}\,(1+\beta+\psi+\alpha)} \tag{B.54}$$

$$\frac{\partial z_t}{\partial \tau^l} = \frac{\alpha\left(\bar{Y}_t + \theta\lambda_{\tau^s}Q_t v^w w\right)}{Q_t\theta\lambda_{\tau^s}\,(\tau^l-1)^2\,(1+\beta+\psi+\alpha)} \tag{B.55}$$

Similarly as before, Equations (B.52) and (B.54) demonstrate that the sign of the effect of the cash transfer on child time allocation and household consumption depends on the relationship between the income effect and the substitution effect of government transfer, that is, if $\bar{Y}_t - \theta\lambda_{\tau^s}Q_t \gtreqless 0$. Note that the parameter θ, which measures the share of time allocated to schooling that the government is willing to subsidize, also plays a role in defining the sign of the effect. Regarding the allocation of time of the parent, Equations (B.55) shows that an increase in the cash transfer is associated with a rise in parent's leisure.

Discussion

Several factors play a role in influencing household decisions regarding child activities. First, the model results show that the income effect of the transfers induces the household to increase child schooling, child leisure, and household consumption. This situation occurs because the transfer increases the household income and allows the parent to increase consumption and schooling. Since child leisure increases household utility, additional household resources from the transfer also induce the parent to increase child leisure and reduce child labor. On the other hand, the substitution effect causes a reduction in child schooling, child leisure, and household consumption, implying an increase in child labor. This phenomenon occurs because consumption and the allocation of the child's time towards schooling and leisure are more expensive than the leisure time of the parent. As a result, the net impact of a government cash transfer on child time allocation and household consumption depends on the magnitude of each of these effects. Second, the result of the model suggests that child-specific attributes influence the optimal determination of household decisions related to a child's schooling, work and leisure. Equation (B.37) shows that school ability fosters the accumulation of human capital. If we examine the comparative statics of the household's optimal decisions with respect to the human capital of the child and the child's market ability (v^w), we have:

$$\frac{\partial h_t}{\partial Q_t} = \frac{-\left(\bar{Y}_t \psi \tau^l\right)}{Q_t^2 \lambda_\tau v^w w \left(1 + \beta + \psi + \alpha\right)} \tag{B.56}$$

$$\frac{\partial s_t}{\partial Q_t} = \frac{\beta \left[c\lambda_\tau \left(1 - \tau^l\right) + v^w w \left(c\lambda_\tau - \bar{Y}_t \tau^l\right)\right]}{\lambda_\tau \left(c + Q_t v^w w\right)^2 \left(1 + \beta + \psi + \alpha\right)} \tag{B.57}$$

$$\frac{\partial h_t}{\partial v^w} = \frac{-\psi \left[Q_t \lambda_\tau + \tau^l \left(\bar{Y}_t - \lambda_\tau Q_t\right)\right]}{Q_t \lambda_\tau v^w w \left(1 + \beta + \psi + \alpha\right)} \tag{B.58}$$

$$\frac{\partial s_t}{\partial v^w} = \frac{-Q_t \beta w \left[\lambda_\tau \left(Q_t - c\right) + \tau^l \left(\bar{Y}_t - \lambda_\tau Q_t\right)\right]}{\lambda_\tau \left(c + Q_t v^w w\right)^2 \left(1 + \beta + \psi + \alpha\right)} \tag{B.59}$$

These equations imply that the endowment of skills affects household decisions regarding children's time allocation. Specifically, higher school ability reduces the allocation of time of the child towards leisure and increases the time allotted to schooling. On the other hand, if the cash transfer income effect is stronger than the substitution effect $\bar{Y}_t - \lambda_\tau Q_t > 0$, higher market ability reduces the allocation of time of the child in leisure and schooling, which implies an increase in child labor. Third, it is important to consider that household preferences, the fraction of low-income families in the economy, the average level of labor income, and tax rates also affect the household's decisions regarding child activities. Lastly, the results of this model may indicate that the impact of cash transfers on the allocation of time of girls and boys could be different if there is heterogeneity in the preference parameters of the human capital or heterogeneity in the endowment of skills among boys and girls.

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