Essays on Intra-Household Decision-Making and Poverty Transfers

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Dedication

"Always do right; this will gratify some people and astonish the rest"–Samuel L. Clemens

Para toda mi familia: Monika, Luis, Lenin, Carlos, Milton, Cynthia, Marti, Emily, Yeho, Mamana, Juanita y Olga. De forma especial para Piedad. Muchas gracias por todo. Los quiero.

Abstract

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This dissertation studies the effects of poverty transfer policies on the behavior of households. Chapter 1, studies how different types of households determine adult members' allocations of time and consumption. Household types are characterized by the presence of partner violence and cash transfers. Using a collective intra-household decision making model, together with data from an experimental evaluation of a cash transfer program in Ecuador, I structurally estimate the parameters of the model. Then, I perform a poverty analysis at the individual level for the different types of households and find that women are substantially poorer than men, and that income distribution is more unequal for women than it is for men. I also find that the policy intervention generated welfare gains in terms of reducing overall and individual poverty. However, these welfare gains are heterogeneous among the different types of households. Particularly, I find that transfers are effective in reducing the gender poverty gap mainly in households where there is no violence. Finally, I estimate indifference scales for the different types of households to measure how much income an individual living alone needs to have in order to be as well off as when living as a couple. I find that men need a higher share of initial household resources compared to women, and that indifference scales for women decrease with violence and increase when the household is a beneficiary of the transfer. This work contributes to understanding how intra-household allocation of resources takes place among different types

of households, the importance of gender difference in poverty and inequality, and the effectiveness of poverty policies when there are factors that generate inequality in consumption.

Chapter 2 analyzes how exogenous changes in household income coming from a cash transfer program alter the bargaining power of the recipient and the allocation of time within the family. Using a large-scale living standards measurement survey from Ecuador, I am able to implement a fuzzy regression discontinuity by exploiting the government mechanisms to assign beneficiaries of the program. Then, I examine the impact the cash transfer has on women's and men's hours of paid work, housework, community activities and leisure, as well as whether resource transfers to women through BDH program are in fact effective in improving women's positions within the household, as measured by several questions about decision-making power. I find that the conditional cash transfer program affects the women's freedom to decide (bargaining power) as well as women's time allocation to certain activities.

Chapter 3 investigates the effect of a cash transfer on the household decisions regarding child activities (schooling, work, leisure), and the allocation of hours towards working activities. For this analysis, I use data from a randomized evaluation of a conditional cash transfer program in Ecuador. The empirical results suggest that the most prevalent behavioral shift caused by the program was a reduction in the probability that the household decide only sending the child to work, an increase in the probability that the household chooses concurrently work and school, and an increase in the likelihood that a household chooses schooling only for the child. Moreover, these effects are heterogeneous among boys and girls. 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. To rationalize these findings, I develop a theoretical model of parental decision regarding child activities. With this framework, I argue that a cash transfer attenuates the likelihood of parents choosing leisure and market work for their child and increases the likelihood that they send the child to school. By modeling the cash transfer as a subsidy of the human capital input and as lump sum transfer, this study also contributes to the discussion of whether cash transfers should be conditional (on school enrollment) or

unconditional.

Contents

List of Figures

List of Tables

Chapter 1

Intra-Household Allocations and Consumption Inequality under Cash Transfers and Violence

1.1 Introduction

Understanding how households allocate resources under different circumstances is crucial in order to correctly measure the well-being of individuals. Many countries and international institutions use adult equivalence scales to measure individual-level consumption and to derive measures of poverty and inequality. These measures are commonly used to assess the effectiveness of policy interventions in reducing poverty. Unfortunately, this methodology entirely ignores possible within-household inequalities. In particular, this procedure does not take into consideration factors that could lead to an asymmetric distribution of resources among individuals within a family. Heterogeneity among individual household members, and heterogeneity in household environments in which they might find themselves, could have important implications for the measurement of social welfare (see Lise and Seitz 2011; Dunbar, Lewbel and Pendakur 2013).

I show that taking into account the process of intra-household resource allocation, together with important factors that affect the behavior of individuals within the household, allows one to better measure individual well-being and to analyze the effectiveness of policy interventions designed to reduce the gender gap in poverty and inequality.

The purpose of this paper is to estimate adult members' allocations of time and consumption inside different types of households and the associated welfare consequences. In my analysis, households are heterogeneous in the sense that they may or may not receive a cash transfer and that there may or may not be partner violence within the household. In this model violence is assumed to be exogenous but characterize the type of bargaining power and home production technology that household members face.[1] The goal of this study is to estimate individual shares of resources based on consumption, using a collective model of household decision-making. The

[1]So, in the context of the model, when a household is formed, it immediately becomes either violent or non-violent and conditional on this reality, household members make decisions. This assumption is based in evidence that show that violent childhood experiences increased the risk of victimization or perpetration of intimate partner violence in adulthood, creating role models that perpetuate violence (Bancroft, Silverman and Ritchie 2011; Whitfield et al. 2003).

structure of the model allows one to quantify the incidence of poverty and the level of inequality at the individual level (rather than at the household level) for adult members within these distinct types of households. It also allows one to evaluate the effectiveness of the policy intervention in reducing poverty. I find that there are overall important differences in poverty levels among men and women, and that these gaps vary across different types of households. Moreover, I show that the cash transfer policy generated welfare gains in terms of reducing overall and individual poverty. However, these welfare gains are heterogeneous across the different types of households. This work contributes to understanding how the intra-household allocation of resources takes place across different types of households, the extent of gender difference in poverty and inequality, and the effectiveness of poverty policies when there are factors that generate inequality in consumption.

Intimate partner violence is a perverse, widespread social problem that could have important consequences for the ways that resources are allocated within households. This allocative process is complex and becomes even more intricate when household behavior in poverty situations is considered. Poor individuals face particularly severe resource constraints and are more prone to domestic violence, as poverty can act as a fueling factor when there is disagreement in preferences. However, to mitigate the violent abuse of women and to improve child well-being, many countries run social protection programs seeking to promote gender empowerment among women.

A randomized evaluation of a program that provides transfers to families in Ecuador, implemented in 2011, provided an environment in which an exogenous transfer is targeted to women to grant them with a higher share of household resources. Taking advantage of the comprehensive dataset generated by this program, this paper examines how adult household members allocate time and consumption in the presence of transfers and violence. To do this, I use a collective model of household decision-making. In my model, transfers affect the relative power among household members and the non-labor income component of household resources, whereas violence affects the production technology of the domestically produced good as well as husbands' and wives' Pareto weights. In this model, adult members' preferences depend on their leisure, individual private consumption of market goods, and the con-

sumption of a domestically produced good. Applying an estimation strategy based on a two-stage allocation representation of the collective model and using a flexible parametric specification, I structurally estimate the parameters of the model. (see Chiappori 1988, 1992; Blundell et al. 2007; Cherchye, De Rock and Vermeulen 2012).

The results reveal which factors influence the preferences of adult household members, home production and the Pareto weights. I use the estimated model to investigate whether there are patterns of within-household specialization by simulating changes in wages. This is relevant, because within-household specialization may have important consequences for the well-being of individuals. In my sample, households appear to be specialized, in the sense that there is a division of labor within the household, with husbands devoting more time to labor market activities, and wives assuming more responsibility for housework activities. I also analyze empirically whether higher wages for wives are more beneficial than higher wages for husbands for increasing the level of the home-produced good in an average household. Results suggest that higher wages for husbands have a stronger impact on the level of the home-produced good, which is consistent with specialization within these households.

The main goal of the model is to provide a theoretical structure for an empirical analysis of intra-household welfare. In this context, I evaluate individual (as opposed to a household level) poverty and inequality using the estimated parameters from the structural model, which allows one to construct individual measures of consumption. I use three measures of consumption: a widely used measure that uses equivalence scales adjustment; a measure that assumes a linear consumption technology a la Barten, and a measure that accounts for the individual marginal willingness to pay for the home good. Significant discrepancies are found in the level of resources that husbands and wives control among different types of households. These gaps translate into heterogeneity in the incidence of poverty for men and women, both overall and also contingent on the type of household.

The results show that women are substantially poorer than men. Poverty is more than 23 percentage points higher for wives than for husbands. I also find that households where there is intimate partner violence exhibit larger gender poverty gaps (between 29 and 30 percentage points) compared to households where there is no

violence (between 15 to 28 percentage points). Furthermore, transfers are more effective in mitigating this gender gap in households where there is no violence (around 13 percentage points gap reduction). This shows that cash transfer policies could be ineffective in reducing individual level poverty under certain household circumstances. In relation to inequality, results show that income inequality is the highest on households that do not receive transfers and have partner violence (an income Gini coefficient of 0.451). Results also show a higher level of income inequality for women relative to men in all types of households. However, households that receive the transfer exhibit lower levels of women's inequality. Finally, I use the model to calculate indifference scales following Browning, Chiappori and Lewbel (2013) in order to define the income that each individual needs when living alone to be equally well off (in utility terms) as when they are living in his or her current household. Results show that husbands need a higher level of the initial household resources (between 80 and 89 percent) than women (between 71 to 78 percent) to be as well-off as in a couple. In addition, I find that indifference scales for women decrease with violence and increase when the household is a beneficiary of the transfer.

Related Literature

This paper is related to three lines of literature: (i) literature that studies cash transfers and household decisions, (ii) literature on targeted poverty transfer and bargaining power, and (iii) literature on collective intra-household models that allow one to estimate individuals' allocation of resources.

Regarding the first two branches of literature, in the last twenty years considerable amounts of investment have been made seeking to boost women's empowerment. Social transfer programs have expanded across less developed countries and have gradually become an important component of anti-poverty budgets in many governments (Fiszbein et al., 2009). To promote desirable social outcomes such as better childhood education and health, productive activities for women and gender empowerment, several countries have designed programs specifically to place resources in the hands of women. This approach assumes that women care more about the household's children

and other household public goods than men do.

The literature has shown that monetary incentives can have important effects on households' behavior (see, for example Bobonis 2009; Attanasio and Lechene 2014; Angelucci and Garlick 2016). In addition, empirical studies have provided evidence of the effect of these programs on children's school performance, health, and nutrition (see, for instance, Thomas 1990; Duflo 2003; Gertler 2004; Behrman, Sengupta and Todd 2005; Paxson and Schady 2010; **?**; Doepke and Tertilt 2011). Many of these studies have examined the effect of the randomized treatment on the outcomes of interest. However, this is not informative about either the mechanism behind the intra-household choices or the identification of the actual control of resources. Regarding household allocation of consumption, Schady and Rosero (2008), Angelucci and Attanasio (2013) and Attanasio and Lechene (2014) show that cash transfer programs targeted at mothers are associated with constant or higher shares of household expenditure on food. In contrast, using a randomization of the gender of the recipient, Benhassine et al. (2015), Akresh, De Walque and Kazianga (2016) and Haushofer and Shapiro (2016) found no significant differences in program effects on household consumption, production and investment decisions. These diverse results suggest that a picture related to the mechanisms behind intra-household allocations is still far from clear. To better understand these mechanisms, it is advantageous to use models of household behavior to identify the redistribution and the control of household resources among individual members and to understand the potential effects of poverty policies on these intra-household allocations.

In terms of analyzing the role of violence within a household, Eswaran and Malhotra (2011) construct a non-cooperative household model where adult members' bargaining power is affected by violence. Empirically, an interesting result is obtained by Angelucci (2008), who found a non-monotonic relationship between transfer amounts and violence. Large transfers generate a tendency toward more violence, while small transfers are associated with a decrease in violence. Bobonis, Gonzalez-Brenes and Castro (2013) showed that women beneficiaries of the program are less likely to be victims of physical abuse, but are more prone to be victims of emotional violence, and Hidrobo, Peterman and Heise (2016) showed that transfers induce a reduction

in physical or sexual violence. In contrast, Hidrobo and Fernald (2013) found that conditional cash transfers did not appear to have an effect on physical violence, although, when a woman is more educated than her partner, the program can increase emotional violence. To account for this, I include intimate partner violence in my model of household behavior as an important component of bargaining power and home good productivity.

Regarding the third branch of literature, this paper benefits from the recent developments in collective intra-household decision models. It is well known that the unitary approach fails to explain how resources are distributed within a household, which has important implications for poverty analysis. Many studies have developed non-unitary models that incorporate heterogeneous preferences of family members (Manser and Brown 1980; McElroy and Horney 1981; Lundberg and Pollak 1994; Chen and Woolley 2001). A relevant point of departure is the collective intra-household decision-making framework proposed by Chiappori (1988), Chiappori (1992) and Apps and Rees (1996). These types of models have become an important tool for analyzing household allocation decisions, since they provide an intuitive and manageable framework to study the distributional impacts of public policies.

Several subsequent studies have contributed to making this framework more tractable for empirical purposes (Browning et al. 1994; Blundell et al. 2007; Browning, Chiappori and Lewbel 2013; Chiappori and Ekeland 2006, 2009). The advantage of using this framework is the potential to identify—under reasonable conditions—the fundamentals such as household members' preferences and the household decision-making process (Chiappori and Ekeland 2009). Another advantage is the small set of assumptions required—mainly the Pareto efficiency of the household allocation process—and the ability to derive strong testable restrictions.

In this context, other attempts to identify resource shares have relied on the assumption that single women and men have similar preferences to those of married women and men (Browning, Chiappori and Lewbel 2013; Lewbel and Pendakur 2008; Lise and Seitz 2011; Bargain and Donni 2009). However, Dunbar, Lewbel and Pendakur (2013) proposed a framework that relaxed the assumptions related to similar preferences for different types of households. Similarly, the model developed in this

paper does not rely on the restrictive assumption of similarity of preferences across different types of households, as the data from the intervention in Ecuador provide sufficient information at the individual level to identify all the necessary parameters.

To model household behavior with public goods, I follow the work of Blundell, Chiappori and Meghir (2005). They show that these types of models can be non-parametrically identified (up to a constant) by observing labor supplies and the demand for the public good. My model is closely related to that of Cherchye, De Rock and Vermeulen (2012), who generalize the model of Blundell, Chiappori and Meghir (2005) by adding household production of public goods. Another key feature of this model is that it is appropriate for empirical implementation when data on individual consumption and time use are available.[2] The richness of the data I use allows me to estimate the structural model and to study how different types of households allocate resources, the implications in terms of individual well-being and the effectiveness of poverty transfers in reducing poverty gaps.

In the subsequent sections I will presents the key features of the data and the collective intra-household bargaining model that I use. Then, I show the identification strategy, the estimation results and the implications in relation to the measurement of individual poverty, the effectiveness of the poverty transfers, and measures of indifference scales. A conclusion is provided at the end of the chapter.

1.2 Data

1.2.1 Program Description

To study how households respond to poverty transfers under violence, I use data from a randomized evaluation of an intervention implemented by the World Food Programme in Ecuador called "Food, Cash, or Voucher". The program was carried out only in 2011. Beneficiaries received a monthly transfer of 40 U.S. dollars for

[2]Blundell, Chiappori and Meghir (2005) provide an estimation of this extended model with public goods production by exploiting detailed Dutch data.

6 months.[3] The transfer was delivered in two different formats: as a cash transfer or as an in-kind transfer. The in-kind transfer could be either a food basket or a redeemable voucher.[4] The conditionality of the program was to attend a nutritional training program. The goal of the program was to promote better food consumption, empower women in terms of food consumption decisions, and mitigate the strained relations between Colombian refugees and Ecuadorian citizens. The program was implemented in two northern provinces of Ecuador: Carchi and Sucumbios (see Figure (A.1)). Within these provinces, seven urban centers[5] were selected and divided into 84 neighborhoods. From these 84 neighborhoods, 61 were randomly assigned to the treatment group and 19 were assigned to the control group. These neighborhoods were further divided into geographical units labeled clusters. Within the treated arm, 110 clusters in the 61 treated neighborhoods were randomly assigned to the program.

The intervention sample consist of 2,357 households. Of these 2,357 household, 652 were assigned to the control group and the remaining 1,705 were treated households, who were divided into three almost equal parts to be assigned to receive the food basket, the cash transfer or the voucher. Only poor households and households with at least one Colombian member were eligible for the program. If any household member already participated in the Governmental cash transfer program, the household was ineligible for this program. Of the 2,357 households interviewed between March and April of 2011, 2,122 were resurveyed between October and November of 2011.

This dataset is particularly useful for the present analysis because the transfer incentives were exogenous and sufficient to have a real effect on households' behavior. In addition, the information available in the dataset is very comprehensive and includes variables necessary to empirically estimate the proposed structural model.

[3]In terms of the household income this transfer represents around 10 percent of the average household monthly income.

[4]The food basket consisted of rice (24 kg), lentils (8kg), vegetable oil (4 l) and canned sardines (8 cans). The redeemable voucher transfer was under the female's head or female partner name, and could be used at local supermarkets to acquire a list of pre-approved goods such as the ones in the food basket. The cash transfer was delivered using banks automated teller machines (ATMs).

[5]These urban centers had more than 10 percent of Colombian refugees, more than 50 percent of people living in poverty, a local provider to implement food distribution, and financial institutions to distribute cash via ATMs.

1.2.2 Data Description

In this study, I will concentrate on physical and sexual violence to be consistent with literature related to intimate partner violence (Garcia-Moreno et al. 2005). Physical violence is constructed using questions that ask the female whether she has been pushed, slapped, punched, kicked, strangled, and threatened or attacked with a weapon by her partner. Similarly, sexual violence is constructed using questions that ask the female whether her intimate partner forced her to have sex or to commit sexual acts she did not approve. In the descriptive statistics, I also provide a measure of emotional violence. Emotional violence is related to questions that ask the female whether she has been threatened with abandonment, threatened with being taken away from her children, threatened with being hurt, humiliated, or ignored by her partner in the last 6 months.

A woman suffering from physical or sexual violence with her partner as the perpetrator was considered as a victim of intimate partner. For the empirical analysis, I construct an index of violence that takes into consideration the physical and sexual dimension of violence and ranges from 0 to 1. This index captures the different forms of violence that the female experienced in the last 6 months by hands of her partner: pushed, slapped, punched, kicked, strangled, threatened with a weapon, attacked with a weapon, forced to perform sexual acts that she did not approve, forced to have sex and life-time violence. For instance, a female who reported being pushed, slapped and punched, but who did not suffer any of the other assaults listed, has an index of 3/10=0.3.

Table (1.8) presents selected descriptive statistics of household characteristics. All statistics are from the sample used for the analysis, differentiating among control and treatment households. All the households in the analysis consisted of a couple. The average man in the sample was 39 years old, whereas the average woman was 35 years old. The average age difference within the sampled couples is 3.8 years.

Table (1.8) also reveals differences in the allocation of time to different activities. Women allocate more hours to housework activities (around 6 more hours) than men. On the other hand, men allocate more hours to market work than women (around

1 more hour) and earn slightly higher wages per unit of labor. In addition, Table (1.8) shows average consumption patterns expressed in dollars per month. Private consumption of women is slightly higher than that of men. Expenditures on public goods, including on children, represent a large share (more than 80 percent) of household total consumption.

Around 42 percent of these couples are married. The remaining 58 percent are cohabiting. Men and women have similar years of education with 39 percent of the women and 38 percent of men having some secondary education or higher.

1.2.3 Some Reduce Form Relationships

In this section, I document the impact of the transfer on time allocation, as well as on household consumption. I estimate the following linear model[6]:

$$Y_{ij1} = \alpha + \beta T_i + \gamma Y_{ij0} + \delta P_{ij} + \theta_j + \varepsilon_{ij} \tag{1.1}$$

where Y_{ij1} represents the outcome of interest (allocation of time or consumption) for household i located in province j at the end of the intervention and Y_{ij0} is the outcome of interest at baseline. T_i is an indicator that equals one if household i is a program beneficiary and therefore β is the coefficient of interest, which represents the intent-to-treat estimator. P_{ij} is an indicator for the level of stratification or province and equals one if a household resides in Sucumbios at baseline.[7] Both θ_j and ε_{ij} are i.i.d errors across clusters and across households within clusters, respectively.

In Table (1.9) I show the influence of the transfer on household adult members' time allocation. Columns (1) to (6) present the estimates for women, and columns (7) to (12) display the estimates for men. For each category of time use, I estimate Equation (1.1) to assess the effect of the pooled treatment and then compare it to the estimates of the in-kind and cash treatment arms in the subsequent columns. The program has an effect over the allocation of time of women, whereas for men

[6]In this regression, I take into account serial correlation by controlling for the value of the outcome variable at baseline (see similar approach in McKenzie, 2012)

[7]As it is observable Figure (A.1), the program was implemented in the two dark gray provinces Carchi and Sucumbios.

the effect of the program is mostly statistically insignificant. Receiving the program increases women's time allocated to housework (by 0.72 hours per day) and reduces leisure activities (by 0.62 hours per day). There is no effect on time devoted to the labor market for either men or women. These effects are similar across the different treatment-arms.

I also use the structure of Equation (1.1) to investigate the impact of transfers on intra-household allocation of consumption. Several studies in the literature claim that cash transfer programs increase the share of food in total consumption. A possible mechanism is that an exogenous source of income changes the intra-household bargaining power of women, which then influences the allocation of resources devoted to food (see Schady and Rosero 2008; Bobonis 2009; Angelucci and Attanasio 2013; Attanasio and Lechene 2014). Table (1.10) shows the impact of the transfer on household consumption. As before, for each category of household consumption I estimate the effect of the pooled treatment and compare it to the estimates of the in-kind and cash treatment arms in the subsequent column. Receiving the program increases public consumption, whereas private consumption of men and women are not affected by the transfer. More specifically, the program increases public consumption (35.9 dollars per month) and the impact is similar across the different treatment arms. This relationship could be influenced by the mechanism explained in the literature but also by changes in individual preferences due to effect of the conditionality.

Finally, I analyze heterogeneity in changes in time allocation and consumption by different levels of intra-household violence. Figures (A.2) and (A.3) I document the impact of receiving the program on time allocation and the level of consumption, separately for different violence levels. Each curve is generated by calculating the reduced form effect of the program on time allocation and consumption by baseline intimate partner violence index. In Figure (A.2), the left axis is the change in hours per day of each adult member at follow-up (program recipients vs. non-recipients). Confidence bounds are not displayed to preserve readability. When the baseline level of intra-household violence is low, women in households that receive the transfer increase their home hours and decrease their work hours. This situation changes when there is a relative high level of violence; women in households that receive the

transfer decrease home hours and increase work hours. For men, when the level of intra-household violence is low, the program leads to a slight increase in work hours, however, when there is a high level of intra-household violence, the program leads to an increase in both: home hours and work hours.

In Figure (A.3), the left axis represents the change in dollars per month allocated to consumption at follow-up. When the baseline level of intra-household violence is low, the program increases household public consumption; however, this positive effect decreases as the level of violence increases. Private consumption of men and women are not affected by the program when there are low levels of violence, however when intra-household violence is relative high, the program increases the levels of men's and women's private consumption.

1.2.4 Decomposing Effects into Extensive and Intensive Margins

Treatment effects on outcomes such as the decisions to allocate time to the labor market and domestic activities as well as the decision to inflict violence can occur both at the extensive margin and at the intensive margin. This distinction is important, as intensive margin effects indicate that treatment is changing the patterns of specialization of the households or the overall household environment in the case of violence. I follow the approach proposed by Attanasio, Kugler and Meghir (2011) and Carranza et al. (2019) to decompose labor market effects into extensive and intensive margins. The decomposition exposed in Equation (1.2) is for working hours, however the same procedure applies to the other the outcomes of interest. Using the law of iterated expectations and the fact that observed hours are zero for non-employed individuals, it is possible to write the average treatment effect on work hours as:

$$\underbrace{\mathbb{E}\left[Hours \mid T=1\right] - \mathbb{E}\left[Hours \mid T=0\right]}_{ATE\ for\ hours}$$
$$= \underbrace{\left(\mathbb{E}\left[Hours \mid T=1, W=1\right] - \mathbb{E}\left[Hours \mid T=0, W=1\right]\right)}_{ATE\ for\ hours \mid employment} \cdot \underbrace{Pr\left[W=1 \mid T=1\right]}_{Treated\ employment\ rate}$$
$$+ \underbrace{\mathbb{E}\left[Hours \mid T=0, W=1\right]}_{Control\ earnings \mid employment} \cdot \underbrace{\left(Pr\left[W=1 \mid T=1\right] - Pr\left[W=1 \mid T=0\right]\right)}_{ATE\ for\ employment} \tag{1.2}$$

The first line on the right-hand side of Equation (1.2) is the intensive margin effect. If treatment only changes the employment rate but has no effect on hours for employed individuals, then this term is zero. The second line on the right-hand side of Equation (1.2) is the extensive margin effect. If treatment has no effect on the employment rate, then this expression is zero. Intuitively, the extensive margin effect on hours is the average treatment effect on employment multiplied by the mean hours for employed control group members. The intensive margin effect on hours is the average treatment effect on hours minus the extensive margin effect. In equation (1.2), the only term that is not identified is the average treatment effect on hours conditional on employment. Therefore, this term can be consistently estimated using the formula in Equation (1.2). The standard errors are computed by estimating all quantities as a system and using the Delta method.

Results of the decomposition exercise are presented in Table (A.1). The cash transfer affects primary women's housework activities and intimate partner violence. The effect on women's housework activities is mainly driven by the intensive margin effect. On the other hand, the program shifts intimate partner violence mostly at the extensive margin. There is also an effect of the program on men's housework activities at the extensive margin, however the overall effect is not statistically significant. Finally, there is no statistically significant effect of the program at the intensive or extensive margin for men's or women's time allocation to the labor market.

1.3 A Model of Intra-houshold Bargaining under Cash Transfers and Violence

The empirical results from the previous section reveal that transfers affect the intra-household allocation of time and consumption. They also indicate that there is some heterogeneity in these effects over levels of intimate partner violence. Although these empirical results are informative, they do not provide information on the mechanisms that operate behind the intra-household allocation of resources among different types of households. This section presents the collective intra-household bargaining model that I use to describe how households make decisions and allocate resources to each adult member within different types of households. Following Blundell, Chiappori and Meghir (2005), Cherchye, De Rock and Vermeulen (2012) and Chiappori and Mazzocco (2017), I use a parsimonious collective household model with home production, which allows me to study the allocation of resources within the household and obtain measures of individual control of resources. This framework is useful for subsequently analyzing poverty and inequality at the individual level.

Agents and Preferences

Consider a household formed by two agents $i \in \{♀, ♂\}$. I assume that all households are composed by one female (♀) and one male (♂) i.e. all men and women live in couple households, formed by one woman ('wife') and one man ('husband'). Each individual is endowed with one unit of time. In this model, men and women allocate their time endowment between home production (h^i), the labor market (m^i) and leisure (l^i).

Both agents derive utility from private consumption (c^i) , leisure, and a sub-utility u^Q that represent a public home produced good, the output of which is unobserved:

$$U^i\left(c^i, l^i, u^Q\right) \tag{1.3}$$

Home Production

Higher levels of u^Q require more home production, which is assumed to be done by combining the following inputs: a market acquired good and men's and women's time ($h^{\text{♀}}$ and $h^{\text{♂}}$):

$$u^Q = F(v)\ u^Q\left(c^Q, h^{\text{♀}}, h^{\text{♂}}; \mathbf{s}^Q\right) \tag{1.4}$$

The sub-utility function u^Q is assumed to be twice continuously differentiable, strictly increasing and strongly concave in all its arguments. Additionally, similar as in Cherchye, De Rock and Vermeulen (2012), it is assumed that the sub-utility function u^Q is linearly homogeneous in its arguments, which implies that the household production technology is characterized by constant returns to scale.

More specifically, the domestic good u^Q can be understood as having a higher home quality including child-care and a livable house. I make the standard assumption that the domestic good is produced in an efficient (i.e., cost minimizing) manner. F represents the total factor productivity which could be influenced by violence. The vector $\mathbf{s}^Q$ in Equation (1.4) contains production shifters associated with the domestic good. I define a production shifter as a variable that affects individual utility only through the household production technology.[8]

Budget Constraint and Cash Transfer

There is a Hicksian composite good that can be consumed privately ($c^{\text{♀}}$ and $c^{\text{♂}}$) or used to buy inputs for the home production (c^Q). The price of the Hicksian good is normalized to one. Each member of the household can earn a labor income w^i for each unit of labor market work. In addition, the household has a non-labor income y and could also receive a transfer denoted by t. Therefore, the household budget constraint is:

[8]For instance, a production shifter could be the average age of the children in the household. It can be argued that this variable directly influences the household production technology (e.g., because younger children require more maternal care than older children, ceteris paribus).

$$c^{♀} + c^{♂} + c^{Q} = w^{♀}m^{♀} + w^{♂}m^{♂} + y + t \tag{1.5}$$

Couple Household's Optimization Problem

The problem of the household is to maximize the sum of female and male utilities.[9] As it is standard in the literature on collective models (Chiappori 1988, 1992), assume that the household makes Pareto-efficient decisions. Therefore, efficient allocations result from the following maximization problem:

$$\begin{aligned} \max_{l^{♀},l^{♂},h^{♀}h^{♂},c^{♀},c^{♂},c^{Q}} \quad & \mu\left(w^{♀},w^{♂},y,t,v,\mathbf{z}\right)U^{♂}\left(c^{♂},l^{♂},u^{Q}\right)+ \\ & \left(1-\mu\left(w^{♀},w^{♂},y,t,v,\mathbf{z}\right)\right)U^{♀}\left(c^{♀},l^{♀},u^{Q}\right) \\ \text{subject to :} \quad & \\ & c^{♀} + c^{♂} + c^{Q} = w^{♀}m^{♀} + w^{♂}m^{♂} + y + t \\ & u^{Q} = F\left(v\right)\, u^{Q}\left(c^{Q},h^{♀},h^{♂};\mathbf{s}^{Q}\right) \\ & l^{i} + m^{i} + h^{i} = 1 \quad (i = ♀,♂) \end{aligned} \tag{1.6}$$

The first constraint represents the household budget constraint, and the second is the production function for the home good. Note that the cash transfer enters directly into the budget constraint, providing the household more resources to allocate to private consumption or the home production input. The third constraint limits the total time allocated to the different activities to be no larger than the time endowment, which is normalized to 1. The Pareto weight represents the relative bargaining power of the man in the household. It is a function of individual wages ($w^{♀}$ and $w^{♂}$), non-labor income y, the cash transfer t, the level of violence v, and a vector of distribution factors $\mathbf{z}$. Distribution factors are defined as variables that affect the bargaining power without affecting preferences. In this model it is important to observe at least one distribution factor to identify the model.[10] Finally, household's optimal choices $(l^{♀}, l^{♂}, h^{♂}, h^{♂}, c^{♂}, c^{♂}, c^{Q})$ are observable functions of the adult members' wages $w^{♀}$

[9] This is a Pareto maximization program with relative weights μ attached to the woman's and $1-\mu$ to the man's utility, where $0 \leq \mu \leq 1$

[10] The literature has proposed many different types of the distribution factors, such as relative incomes, relative wages, the marriage market environment, and the targeting of social transfers (see Bourguignon, Browning and Chiappori 2009).

and $w^{♂}$, the household's non-labor income y, the cash transfer t, violence v, the distribution factors $\mathbf{z}$, and the production shifters in $\mathbf{s}$.

Identification of Parameters

Cherchye, De Rock and Vermeulen (2012) argue that the model can be identified using a two-stage representation of the household decision process. Specifically, the solution to the maximization problem in Equation (1.6) can be decomposed into a two-stage process. In the first stage, household members decide on the level of the home good and a division of the remaining non-labor income between both members. This defines the conditional sharing rule for each member $\rho^i \, (i = ♀, ♂)$, which represents how much of the remaining non-labor income (after expenditures on the inputs that are needed for a given level of the home good) goes to member i. These functions ρ^i, generalizes the sharing rule that Chiappori (1992) introduced for a setting with only private goods.[11]

The second stage deals with the individual trade-off between own leisure and own private consumption, conditional on the level of home good and the budget constraint that includes the sharing rule defined in stage one. Taking $\bar{u}^Q$ as given, the individual maximization problem for member i in the second stage is given by:

$$\begin{aligned} \max_{l^i, c^i} \quad & U^i\left(c^i, l^i, \bar{u}^Q\right) \\ \text{subject to :} \quad & \\ & c^i + w^i l^i = w^i + \rho^i\left(w^♀, w^♂, y, t, v, \mathbf{z}\right) \quad (i = ♀, ♂) \end{aligned} \tag{1.7}$$

As proved by Blundell, Chiappori and Meghir (2005), identification of the model can be obtained using a distribution factor. Chiappori (1988) and Chiappori (1992) proved that the observability of both members individual labor supply functions allows one to recover the sharing rule up to a constant and the individual preferences up to a translation. The only difference between Chiappori's original setting and the Blundell, Chiappori and Meghir (2005) extension to household production is that the unidentified constant generally depends on $\bar{u}^Q$. As in Cherchye, De Rock and

[11] It is important to clarify that in the model ρ^i could be either positive or negative.

Vermeulen (2012), I do not have such an unidentified constant in this model, which implies that the sharing rule and individual preferences are completely identified. The reason for this is that I observe $c^{\text{♀}}$ and $c^{\text{♂}}$ in the data set, which provides two boundary conditions for the individual integrability problems.

1.4 Empirical Implementation

This section presents the parametric structure that will be used to estimate the theoretical model described in the previous section. The estimation will be based on the two-stage allocation process. This two-stage process allows for the use of individual indirect utility functions, which simplifies the derivation of a flexible reduced form functional form for the observables.[12]

Second Stage

To start, assume that in the second stage, individuals' preferences over leisure and private consumption are conditional on the level of domestic good produced and on the available resources defined in the first stage ($w^i + \rho^i$). This can be represented by a conditional indirect utility consistent with the Deaton and Muellbauer (1980) Almost Ideal Demand System (AIDS):

$$v^i\left(w^i, \rho^i, \bar{u}^Q\right) = \frac{\ln\left(w^i + \rho^i\right) - \ln a^i\left(w^i; \bar{u}^Q\right)}{\left(w^i\right)^{\beta^i}} \tag{1.8}$$

where the price index is $\ln a^i\left(w^i; \bar{u}^Q\right) = \left(\alpha_1^i\left(\mathbf{d}^i\right) + \alpha_2^i \ln \bar{u}^Q\right) \ln w^i$ and α_1^i is a function of preference shifters $\mathbf{d}^i$. It is important to note from the specification of Equation (1.8), that it is possible to empirically test for separability between unobserved output of the household production process and individual consumption and leisure by checking the significance of the parameter α_2^i.[13] Roy's identity can be used

[12] To avoid the restrictive assumption that leisure and individual consumption are separable from the unobserved output of the household production process, it is useful to specify individual indirect utility functions. Otherwise, it is very complicated to derive a flexible closed form specification for the observables based on a direct utility representation of the adult members' preferences.

[13] If parameter $\alpha_2^i = 0$, then separability holds.

to recover the conditional leisure and private consumption of each adult member:

$$\begin{aligned} l^i &= \left[\left(\alpha_1^i\left(\mathbf{d}^i\right)+\alpha_2^i\ln\bar{u}^Q\right)+\beta^i\ln\left(\frac{w^i+\rho^i}{a^i\left(w^i;\bar{u}^Q\right)}\right)\right]\frac{\left(w^i+\rho^i\right)}{w^i} \\ c^i &= \left[\left(1-\alpha_1^i\left(\mathbf{d}^i\right)-\alpha_2^i\ln\bar{u}^Q\right)-\beta^i\ln\left(\frac{w^i+\rho^i}{a^i\left(w^i;\bar{u}^Q\right)}\right)\right]\frac{\left(w^i+\rho^i\right)}{w^i} \end{aligned} \tag{1.9}$$

First Stage

Turning to the first stage, the household decides the allocation of its non-labor income y and cash transfer t to ($\rho^{♀}$, $\rho^{♂}$, u^Q). First, specify the household production technology that transforms expenditures on public goods and the time men and women spend on home production into the domestic good u^Q. For simplicity, assume that this technology follows a constant elasticity of substitution form:

$$u^Q\left(c^Q,h^{♀},h^{♂};\mathbf{s}^Q\right) = F\left(v\right)\left(\gamma_1\left(c^Q\right)^{\epsilon\left(\mathbf{s}^Q\right)}+\gamma_2\left(h^{♀}\right)^{\epsilon\left(\mathbf{s}^Q\right)}+\gamma_3\left(h^{♂}\right)^{\epsilon\left(\mathbf{s}^Q\right)}\right)^{\frac{1}{\epsilon\left(\mathbf{s}^Q\right)}} \tag{1.10}$$

where total productivity is affected by violence $F\left(v\right)=e^{\kappa v}$ and $\epsilon\left(\mathbf{s}^Q\right)$ is assumed to depend on the production shifters in $\mathbf{s}^Q$.

Using the parametric indirect utility function that results from the second stage and the household production technology, the first-stage maximization problem is given by:

$$\begin{aligned} \max_{\rho^{♀},\rho^{♂},u^Q} \quad & \mu\left(\cdot\right)\left(\frac{\ln\left(w^{♂}+\rho^{♂}\right)-\ln a^{♂}\left(w^{♂};\bar{u}^Q\right)}{\left(w^{♂}\right)^{\beta^{♂}}}\right)+\left(1-\mu\left(\cdot\right)\right)\left(\frac{\ln(w^{♀}+\rho^{♀})-\ln a^{♀}\left(w^{♀};\bar{u}^Q\right)}{(w^{♀})^{\beta^{♀}}}\right) \\ \text{subject to :} \quad & \\ & \rho^{♀}+\rho^{♂}+g\left(w^{♀},w^{♂}\right)\bar{u}^Q=y+t \end{aligned} \tag{1.11}$$

where $\mu\left(\cdot\right)=\mu\left(w^{♀},w^{♂},y,t,v,\mathbf{z}\right)$ and $g\left(w^{♀},w^{♂}\right)$ comes from the expenditure minimization problem and is given by:

$$g\left(w^{\text{♀}},w^{\text{♂}}\right)=\frac{1}{F\left(v\right)}\left(\left(\gamma_1\right)^{-\frac{1}{\epsilon\left(\mathbf{s}^Q\right)-1}}\left(w^{\text{♂}}\right)^{\frac{\epsilon\left(\mathbf{s}^Q\right)}{\epsilon\left(\mathbf{s}^Q\right)-1}}+\left(\gamma_2\right)^{-\frac{1}{\epsilon\left(\mathbf{s}^Q\right)-1}}\left(w^{\text{♀}}\right)^{\frac{\epsilon\left(\mathbf{s}^Q\right)}{\epsilon\left(\mathbf{s}^Q\right)-1}}+\left(\gamma_3\right)^{-\frac{1}{\epsilon\left(\mathbf{s}^Q\right)-1}}\right)^{\frac{\epsilon\left(\mathbf{s}^Q\right)-1}{\epsilon\left(\mathbf{s}^Q\right)}} \tag{1.12}$$

Let λ be the Lagrange multiplier for the constraint in Equation (1.11). The first order conditions (assuming an interior solution) with respect to $\rho^{\text{♀}}$, $\rho^{\text{♂}}$,u^Q and λ, can be described as follows:

$$\frac{\mu}{\left(w^{\text{♂}}\right)^{\beta^{\text{♂}}}}\frac{1}{\left(w^{\text{♂}}+\rho^{\text{♂}}\right)}=\lambda \tag{1.13}$$

$$\frac{\mu}{\left(w^{\text{♀}}\right)^{\beta^{\text{♀}}}}\frac{1}{\left(w^{\text{♀}}+\rho^{\text{♀}}\right)}=\lambda \tag{1.14}$$

$$-\frac{\mu}{\left(w^{\text{♂}}\right)^{\beta^{\text{♂}}}}\frac{\alpha_2^{\text{♂}}\ln w^{\text{♂}}}{\bar{u}^Q}-\frac{\left(1-\mu\right)}{\left(w^{\text{♀}}\right)^{\beta^{\text{♀}}}}\frac{\alpha_2^{\text{♀}}\ln w^{\text{♀}}}{\bar{u}^Q}=\lambda g\left(w^{\text{♀}},w^{\text{♂}}\right) \tag{1.15}$$

$$\rho^{\text{♀}}+\rho^{\text{♂}}+g\left(w^{\text{♀}},w^{\text{♂}}\right)\bar{u}^Q=y+t \tag{1.16}$$

Equations (1.13), (1.14) and (1.15) can be rearranged as:

$$\left(w^{\text{♂}}+\rho^{\text{♂}}\right)=\frac{1}{\lambda}\frac{\mu}{\left(w^{\text{♂}}\right)^{\beta^{\text{♂}}}} \tag{1.17}$$

$$\left(w^{\text{♀}}+\rho^{\text{♀}}\right)=\frac{1}{\lambda}\frac{\mu}{\left(w^{\text{♀}}\right)^{\beta^{\text{♀}}}} \tag{1.18}$$

$$g\left(w^{\text{♀}},w^{\text{♂}}\right)\bar{u}^Q=\frac{1}{\lambda}\left[-\frac{\mu}{\left(w^{\text{♂}}\right)^{\beta^{\text{♂}}}}\alpha_2^{\text{♂}}\ln w^{\text{♂}}-\frac{\left(1-\mu\right)}{\left(w^{\text{♀}}\right)^{\beta^{\text{♀}}}}\alpha_2^{\text{♀}}\ln w^{\text{♀}}\right] \tag{1.19}$$

Summing Equations (1.17), (1.18) and (1.19), yields:

$$w^{\text{♂}}+w^{\text{♀}}+\underbrace{\rho^{\text{♂}}+\rho^{\text{♀}}+g\left(w^{\text{♀}},w^{\text{♂}}\right)\bar{u}^Q}_{y+t}=\frac{1}{\lambda}\left[\frac{\mu}{\left(w^{\text{♂}}\right)^{\beta^{\text{♂}}}}+\frac{\left(1-\mu\right)}{\left(w^{\text{♀}}\right)^{\beta^{\text{♀}}}}-\frac{\mu}{\left(w^{\text{♂}}\right)^{\beta^{\text{♂}}}}\alpha_2^{\text{♂}}\ln w^{\text{♂}}-\frac{\left(1-\mu\right)}{\left(w^{\text{♀}}\right)^{\beta^{\text{♀}}}}\alpha_2^{\text{♀}}\ln w^{\text{♀}}\right] \tag{1.20}$$

Using Equation (1.20) together with Equation (1.16), provides an expression fort the Lagrangian multiplier:

$$\frac{1}{\lambda} = \frac{w^{\male} + w^{\female} + y + t}{X\left(w^{\female}, w^{\male}, \mu\right)} \tag{1.21}$$

Plugging Equation (1.21) into Equation (1.17), (1.18) and (1.19) yields an expression for the conditional sharing rule and the level of home good as a function of observables:

$$\rho^{\male} = \frac{w^{\male} + w^{\female} + y + t}{X\left(w^{\female}, w^{\male}, \mu\right)} \frac{\mu}{\left(w^{\male}\right)^{\beta^{\male}}} - w^{\male} \tag{1.22}$$

$$\rho^{\female} = \frac{w^{\male} + w^{\female} + y + t}{X\left(w^{\female}, w^{\male}, \mu\right)} \frac{\mu}{\left(w^{\female}\right)^{\beta^{\female}}} - w^{\female} \tag{1.23}$$

$$\bar{u}^{Q} = \frac{w^{\male} + w^{\female} + y + t}{X\left(w^{\female}, w^{\male}, \mu\right)} \frac{1}{g\left(w^{\female}, w^{\male}\right)} \left[-\frac{\mu}{\left(w^{\male}\right)^{\beta^{\male}}} \alpha_2^{\male} \ln w^{\male} - \frac{(1-\mu)}{\left(w^{\female}\right)^{\beta^{\female}}} \alpha_2^{\female} \ln w^{\female} \right] \tag{1.24}$$

To obtain the final expressions for individual leisure and consumption as functions of observables, substitute Equations (1.22), (1.23) and (1.24) into the second stage Equation (1.9). Then, for $(i = \female, \male)$ we have:

$$\begin{aligned} l^i = \Bigg\{ \Bigg[\Theta^i + \beta^i \Bigg[\ln \left(\frac{w^{\male} + w^{\female} + y + t}{X\left(w^{\female}, w^{\male}, \mu\right)} \frac{\mu^i}{\left(w^{\male}\right)^{\beta^{\male}}} \right) - \Theta^i \ln w^{\male} \Bigg] + \\ \beta^i \ln \left(\frac{w^i + \rho^i}{a^i\left(w^i; \bar{u}^Q\right)} \right) \Bigg] \Bigg\} \times \left(\frac{w^{\male} + w^{\female} + y + t}{X\left(w^{\female}, w^{\male}, \mu\right)} \frac{\mu^i}{\left(w^{\male}\right)^{\beta^{\male}}} \right) \end{aligned}$$

$$\begin{aligned} c^i = \Bigg\{ \Bigg[\left(1 - \Theta^i\right) + \beta^i \Bigg[\ln \left(\frac{w^{\male} + w^{\female} + y + t}{X\left(w^{\female}, w^{\male}, \mu\right)} \frac{\mu^i}{\left(w^{\male}\right)^{\beta^{\male}}} \right) - \Theta^i \ln w^{\male} \Bigg] + \\ \beta^i \ln \left(\frac{w^i + \rho^i}{a^i\left(w^i; \bar{u}^Q\right)} \right) \Bigg] \Bigg\} \times \left(\frac{w^{\male} + w^{\female} + y + t}{X\left(w^{\female}, w^{\male}, \mu\right)} \frac{\mu^i}{\left(w^{\male}\right)^{\beta^{\male}}} \right) \end{aligned} \tag{1.25}$$

where:
$\Theta^i = \left\{ \alpha_1^i\left(\mathbf{d}^i\right) + \alpha_2^i \ln \left[\frac{w^{\male} + w^{\female} + y + t}{X\left(w^{\female}, w^{\male}, \mu\right)} \frac{1}{g\left(w^{\female}, w^{\male}\right)} \right] \left[-\frac{\mu}{\left(w^{\male}\right)^{\beta^{\male}}} \alpha_2^{\male} \ln w^{\male} - \frac{(1-\mu)}{\left(w^{\female}\right)^{\beta^{\female}}} \alpha_2^{\female} \ln w^{\female} \right] \right\},$

$\mu = \mu\left(w^{\varsigma}, w^{\sigma}, y, t, v, \mathbf{z}\right)$, $\mu^{\sigma} = \mu\left(w^{\varsigma}, w^{\sigma}, y, t, v, \mathbf{z}\right)$ and $\mu^{\varsigma} = 1 - \mu\left(w^{\varsigma}, w^{\sigma}, y, t, v, \mathbf{z}\right)$.

To recover the inputs of the home production process as functions of observables, use the cost/expenditure function $e\left(w^{\varsigma}, w^{\sigma}, \bar{u}^{Q}\right) = g\left(w^{\varsigma}, w^{\sigma}\right)\bar{u}^{Q}$, apply Shephard's lemma, and plug in Equation (1.24), to obtain the following specification:

$$h^{\sigma} = \left(\frac{w^{\sigma}}{\gamma_1}\right)^{\frac{1}{\epsilon(\mathbf{s}^{Q})-1}} \frac{w^{\sigma} + w^{\varsigma} + y + t}{X\left(w^{\varsigma}, w^{\sigma}, \mu\right)} \left[g\left(w^{\varsigma}, w^{\sigma}\right)\right]^{\frac{-\epsilon\left(\mathbf{s}^{Q}\right)}{\epsilon(\mathbf{s}^{Q})-1}} \left[-\frac{\mu}{\left(w^{\sigma}\right)^{\beta^{\sigma}}}\alpha_2^{\sigma} \ln w^{\sigma} - \frac{(1-\mu)}{\left(w^{\varsigma}\right)^{\beta^{\varsigma}}}\alpha_2^{\varsigma} \ln w^{\varsigma}\right] \tag{1.26}$$

$$h^{\varsigma} = \left(\frac{w^{\varsigma}}{\gamma_2}\right)^{\frac{1}{\epsilon(\mathbf{s}^{Q})-1}} \frac{w^{\sigma} + w^{\varsigma} + y + t}{X\left(w^{\varsigma}, w^{\sigma}, \mu\right)} \left[g\left(w^{\varsigma}, w^{\sigma}\right)\right]^{\frac{-\epsilon\left(\mathbf{s}^{Q}\right)}{\epsilon(\mathbf{s}^{Q})-1}} \left[-\frac{\mu}{\left(w^{\sigma}\right)^{\beta^{\sigma}}}\alpha_2^{\sigma} \ln w^{\sigma} - \frac{(1-\mu)}{\left(w^{\varsigma}\right)^{\beta^{\varsigma}}}\alpha_2^{\varsigma} \ln w^{\varsigma}\right] \tag{1.27}$$

$$c^{Q} = \left(\gamma_3\right)^{-\frac{1}{\epsilon(\mathbf{s}^{Q})-1}} \frac{w^{\sigma} + w^{\varsigma} + y + t}{X\left(w^{\varsigma}, w^{\sigma}, \mu\right)} \left[g\left(w^{\varsigma}, w^{\sigma}\right)\right]^{\frac{-\epsilon\left(\mathbf{s}^{Q}\right)}{\epsilon(\mathbf{s}^{Q})-1}} \left[-\frac{\mu}{\left(w^{\sigma}\right)^{\beta^{\sigma}}}\alpha_2^{\sigma} \ln w^{\sigma} - \frac{(1-\mu)}{\left(w^{\varsigma}\right)^{\beta^{\varsigma}}}\alpha_2^{\varsigma} \ln w^{\varsigma}\right] \tag{1.28}$$

To take the parametric specification to the data, a functional form is needed for the bargaining power. In addition, preference shifters, production shifters, and distribution factors have to be defined. Following Browning, Chiappori and Lewbel (2013) and Cherchye, De Rock and Vermeulen (2012), I define a parametric structure for the bargaining power that uses a simple logistic form that assures that it lies between zero and one:

$$\mu\left(w^{\varsigma}, w^{\sigma}, y, t, v, \mathbf{z}\right) = \frac{e^{\left(\Lambda_1 + \Lambda_2 \frac{w^{\sigma}}{w^{\varsigma}} + \Lambda_3 y + \Lambda_4 v + \Lambda_5 t + \Lambda_6' \mathbf{z}\right)}}{1 + e^{\left(\Lambda_1 + \Lambda_2 \frac{w^{\sigma}}{w^{\varsigma}} + \Lambda_3 y + \Lambda_4 v + \Lambda_5 t + \Lambda_6' \mathbf{z}\right)}} \tag{1.29}$$

Then, the preference shifters are chosen to be a function of age only, and take the following form: $\alpha_1^i\left(\mathbf{d}^i\right) = \alpha_{10}^i + \alpha_{11}^i age^i$ for $(i = \varsigma, \sigma)$. I use the number of

children, children's average age, and violence as production shifters for the home good: $\epsilon\left(\mathbf{s}^{Q}\right) = \epsilon_0^Q + \epsilon_1^Q children + \epsilon_2^Q mean\ children\ age + \epsilon_3^Q violence$. Finally, I consider four distribution factors: difference in the ages of the spouses, probability of receiving the cash transfer, husband's share of household assets and violence.

In order to take into consideration the potential effect of the transfer on violence, I will re-estimate the model with an additional equation that characterizes violence as: $v = \delta_1 + \delta_2 t + \delta_3 v_0 + \delta_5 v_{neighborhood} + \delta_5 \frac{w^{\male}}{w^{\female}} + \delta_6 y$, where t is the probability of receiving the transfer, v_0 is the baseline level of violence and $v_{neighborhood}$ is the frequency of domestic violence in the neighborhood.[14]

Estimation Strategy

The model consists of a system of seven equations (Equations (1.25), (1.26), (1.27) and (1.28)) that characterize $\left(l^{\male}, c^{\male}, l^{\female}, c^{\female}, h^{\male}, h^{\female}, c^{Q}\right)$ as observable functions of the following variables available in the data $\left(w^{\male}, w^{\female}, y, t, v, \mathbf{z}, \mathbf{s}\right)$. To account for unobservable heterogeneity across households, I include additive error terms to the system of equations. The model is estimated via Feasible Generalized Non-Linear Least Squares (FGNLS) estimator. It is assumed that errors are correlated across equations. In this context, the covariance matrix of the model is defined as:

$$\Omega = \Psi \otimes I \tag{1.30}$$

where Ψ is the 7×7 covariance matrix[15] of the nth observation. The covariance matrix Ψ is unknown and therefore it has to be estimated. Following Greene (2018), the procedure for estimating Ψ is as follows:

- First, I run the Non Linear Least Squares estimator (i.e. the weighting matrix of the sum of square errors is chosen to be the identity matrix I).
- Second, I use the resulting residuals to estimate an empirical covariance matrix S.

[14] Results from this alternative specification are available in Appendix.

[15] In the case of the alternative specification, Ψ will be an 8×8 covariance matrix as there is an additional equation for violence.

- Lastly, I minimize the weighted sum of squared errors, where the weight is given by S, which is a consistent estimate of Ψ.

As the set of equations that comprise the structural collective model is highly nonlinear, there is no closed-form solution for the gradient of the nonlinear conditional mean function with respect to the parameters (called pseudo-regressors), which appear in the first-order condition for minimizing the sum of squares. Consequently, I use a numerical solver to estimate the parameters. The solver was run with multiple random initial values.[16]

Following Cherchye, De Rock and Vermeulen (2012), a sufficient condition for a theoretically consistent first-stage allocation is that the parameters α_2^i in the function $\ln a^i \left(w^i; \bar{u}^Q\right)$ for $(i = ♀, ♂)$ are negative. Therefore, during the numerical solving this condition is implemented by using $\alpha_2^i = -e^{\left(\tilde{\alpha}_2^i\right)}$, with $\tilde{\alpha}_2^i$ estimated. The remaining set of parameters are able to move freely within large bounds. The results from the best local optimum found are reported.[17]

Sample

For the model estimation, I use a sample of the randomized intervention database. The data are particularly suitable to estimate this colletive model because they contain expenditure information that allows me to generate both private consumption at the individual level and public consumption. This is important for the exact identification of the model. The sample for the estimation of the structural model includes households with two adult members (one man and one woman), with and without children. As wages are the only source of price variation, I select those couples for which both members are in the labor market, earn a positive wage, and where there is information about time allocation. For these households, I use a consumption-based

[16]The covariance matrix associated with FGNLS makes use of so-called pseudo-regressors that involve derivatives of the regression function with respect to the parameters. Applying the methodology of Goldfeldt and Quandt these derivatives were numerically calculated. There is possibility for approximation error given our the highly nonlinear nature of the system of equations in which the parameters appear simultaneously in different terms (see Greene, 2018).

[17]I selected the lowest local minimum found. I also performed several robustness checks with the parameter values from the other minima found. The obtained results show a picture that is qualitatively similar to the one reported here.

measure of total non-labor income, i.e. non-labor income equals reported consumption expenditures (private and public expenses) minus total household earnings. This approach reduces measurement error and accounts for different sources of unobserved wealth that are important for individual decisions (see Blundell and Walker 1986; Blundell et al. 2007).[18] The final sample consist of 276 households. Although this is a relatively small sample, results suggest that it is sufficient to recover the underlying parameters of the model with a reasonable level of precision.

1.5 Estimation Results

The estimated parameters of the structural model are displayed in Table (1.1). Despite the fact of having a relative small sample, most of the parameters are precisely estimated.[19] The majority of estimated coefficients display an expected sign. Leisure turns out to be a luxury good for both husband and wife given the positive estimated values for β^{σ} and β^{φ}.

From Table (1.1), we can also observe that the domestic good has a significant impact on husbands and wives leisure and consumption since the estimates for α_2^{σ} and α_2^{φ} are both statistically significant. As expected, the signs of these coefficients is negative. This implies that for working couples participating in the transfer program implemented in Ecuador, the output of the household production process is non-separable from the individual trade-off between leisure and consumption. In terms of the home production technology, one extra time unit spent on home production by the mother is far more productive than one extra time unit spent on home production by the father (the parameter γ_2 is considerable larger than γ_1).

Model results also show that the number of children, the average age of children and the level of intra-household violence significantly affect the production of the domestic good u^Q. This is particularly important in the present framework as the identification strategy requires at least one statistically significant production shifter.

[18] In the calculation of non-labor income, I have also subtracted the transfer received from the program since this is an important variable in the present analysis and it is necessary to separate it from the other non-labor income.

[19] With the exception of one parameter, all are statistically significant at 10% 5% and 1% levels.

Table 1.1: Structural Estimation Results

	Parameter	Coefficient	S.E.
Preference			
Parameters	$\alpha_{10}^{\male}$	0.784***	(0.031)
	$\alpha_{11}^{\male}\left[age^{\male}/10\right]$	-0.018**	(0.007)
	$\alpha_{2}^{\male}\left[\bar{u}^{Q}\right]$	-1.369***	(0.058)
	$\beta^{\male}$	0.120***	(0.013)
	$\alpha_{10}^{\female}$	0.735**	(0.031)
	$\alpha_{11}^{\female}\left[age^{\female}/10\right]$	-0.010	(0.007)
	$\alpha_{2}^{\female}\left[\bar{u}^{Q}\right]$	-1.672***	(0.078)
	$\beta^{\female}$	0.100***	(0.023)
Home Production			
Parameters	κ	-0.379**	(0.125)
	γ_1	0.260***	(0.009)
	γ_2	0.449***	(0.015)
	γ_3	0.291***	(0.010)
	ϵ_0^Q	0.022***	(0.000)
	ϵ_1^Q[children]	0.063***	(0.000)
	ϵ_2^Q[mean children age]	-0.013***	(0.000)
	ϵ_3^Q[violence]	0.032***	(0.000)
Bargaining Power			
Parameters	Λ_1	-1.176***	(0.092)
	$\Lambda_2\left[w^{\male}/w^{\female}\right]$	1.000***	(0.041)
	$\Lambda_3\left[y\right]$	0.037***	(0.010)
	$\Lambda_4\left[age^{\male} - age^{\female}/10\right]$	0.336**	(0.162)
	Λ_5[violence]	1.063***	(0.115)
	Λ_6[probability of receiving transfer]	-0.100*	(0.051)
	Λ_7[husband's share of household assets]	0.000***	(0.000)

Notes: The table shows the estimated parameters obtained by the FGNLS estimator. Standard errors in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%

Finally, consider the parameters that influence the Pareto weight.[20] The results in Table (1.1) indicate that the bargaining power is significantly affected by the husband's relative wage, non-labor income of the household and the age difference between the husband and the wife. Further, the probability of receiving the transfer, the transfer share in non-labor income as well as the intra-household violence all have statistically significant effects on husband's bargaining weight.

These parameters have the expected signs and show that the probability of receiving the transfer reduces the husband's bargaining power whereas inflicting violence increases the husband's bargaining power. The significance of the parameters that influence the Pareto weight is useful for the identification strategy, which requires at least one statistically significant distribution factor. Therefore, the estimated model fulfills the necessary conditions for identification. In Table (A.2), I present an alternative specification that takes into consideration the potential effect of the transfer on violence. The estimated parameters are similar to the initial specification. In terms of the additional estimated parameter, the results indicate that after controlling for the baseline level of violence, the probability of receiving the transfer significantly affects the level of violence. Also, the level of intimate partner violence is significantly affected by the husband's relative wage and non-labor income of the household. On the other hand, the frequency of domestic violence in the neighborhood does not affect the level of violence.

The estimated parameters of the structural model allow one to perform an analysis of individual level poverty and inequality, which is the main goal of this paper. However, before proceeding with this exercise, it is worth investigating whether there are some patterns of specialization in these households. When market wages differ between spouses, intra-household specialization could emerge. This will show the effects of changes in available household income on the allocation decisions of each adult member. Therefore, I perform a simulation together with a graphical analysis to show the impact of a change in each of the adult household members' wages on the optimal allocations of the household members' time and consumption.

[20]Recall that the Pareto weight (μ) in this model specification represents the husband's bargaining power

1.5.1 Simulation: Patterns of Within-household Specialization

Within-household specialization implies that couples follow a cooperative household-level strategy in which they divide labor to maximize household well-being. In this context, each partner devotes more time in the activities in which he or she has a comparative advantage. This could have important effects on the well-being of individuals. To investigate whether the households under study tend to behave in this manner, I evaluate how the choice variables vary with changes in husbands' and wives' wages. In this exercise, I consider an average beneficiary household that experience average violence. I use a graphical analysis to explain the how these changes affect the choice variables of the intra-household model.[21] It is important to acknowledge that the outcomes of the different comparative static exercises will be the result of the interaction between individual preferences, the home production process, and the intra-household bargaining power.

Effects of a Change in Husband's Wages

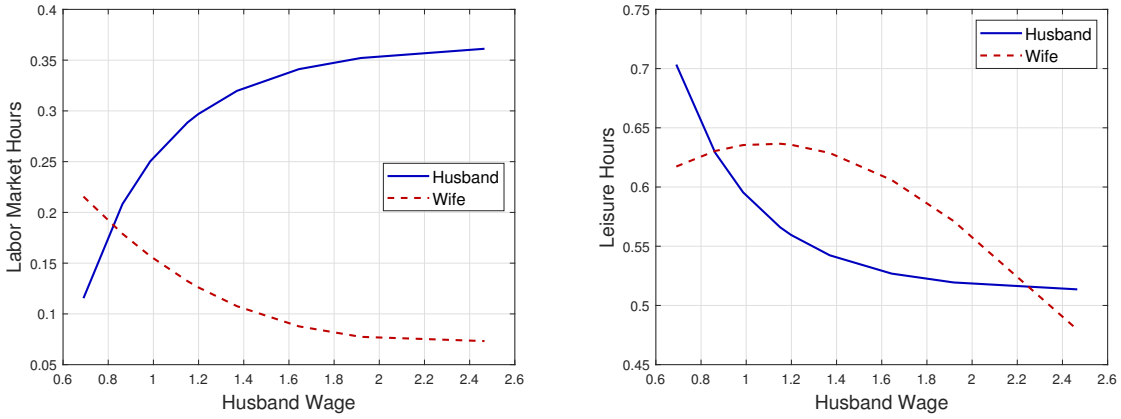
To analyze the impact of a change in the husband's wage on the dependent variables, I select wage changes in a range from the first decile to the tenth decile of the husband's wage distribution. The remaining independent variables are fixed at their means (including the wife's wage).

Figure (1.1) has two panels that portray husbands' and wives' time allocations to the labor market and to leisure activities. As the wage increases, husband's time spent on labor market activities increases. This suggests that the substitution effect dominates the income effect. At the same time, there is a decrease in the amount of time the husband allocates to leisure activities.

[21] The complex structure of the model does not allow me to straightforwardly interpret the magnitudes and effects of parametric changes.

Figure 1.1: Paid Work and Leisure

(a) Labor Market Hours (b) Leisure Hours



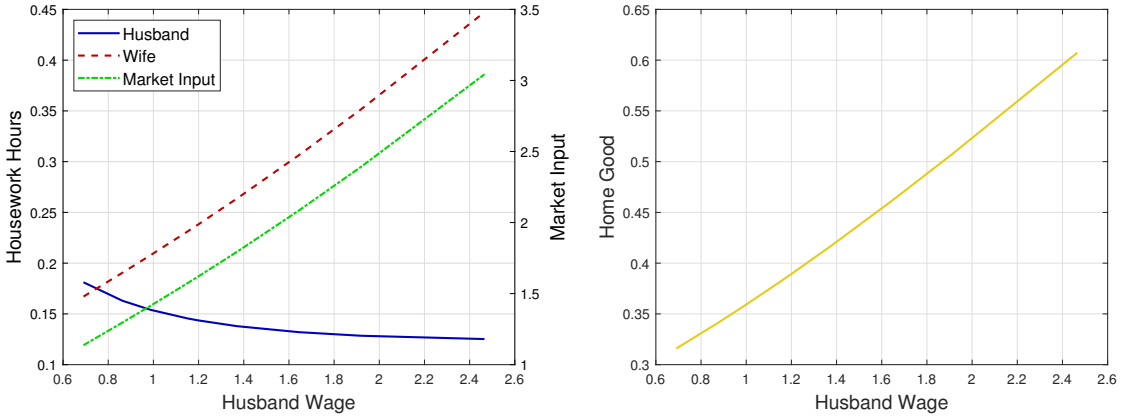
Notes: The left panel depicts the effect of a change in husband's wage on the choice of adult members time allocation to the labor market. The right panel depicts the effect of a change in husband's wage on the choice of adult members time allocation to leisure activities. The wage increments go from the first decile to the tenth decile of the husband's wage distribution, while keeping the other explanatory variables constant at their corresponding means.

On the other hand, turning to the wife's time allocation decisions to the same activities, as the husband's wage increase, her time spent in the labor market decreases and her time spent in leisure activities increases. The two panels of Figure (1.2) show the time allocation to housework activities, expenditures on the domestic good, and the production of the home good. The husband's time spent on housework activities decreases when his wage increases, while the wife's time spent in housework activities increases, as does the household's expenditures on the domestic good. The decrease in the husband's time spent on housework activities is compensated for by the rise in the wife's time spent on housework and expenditures on the domestic good, which leads to an overall increase in the production of home good.

Figure 1.2: Home Good Production

(a) Home Good Inputs

(b) Quality of Home Good

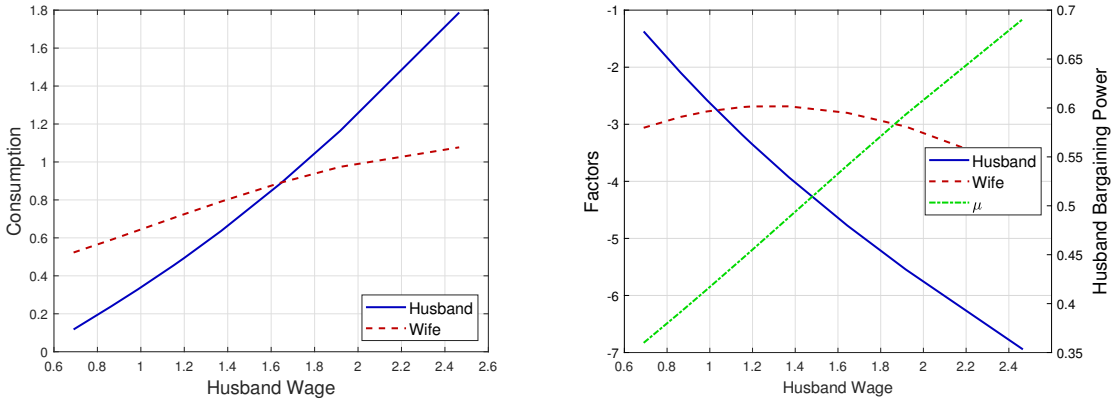


Notes: The left panel depicts the effect of a change in husband's wage on the choice of inputs of home production. The right panel depicts the effect of a change in husband's wage on the production of domestic good. The wage increments go from the first decile to the tenth decile of the husband's wage distribution, while keeping the other explanatory variables constant at their corresponding means.

In Figure (1.3), the two panels show the private consumption of each adult member as well as the distribution factors and the husband's bargaining power. It turns out that the husband's and wife's own private consumption experience an increase when the husband's wage rises, however, the increase in consumption for the husband is more pronounced than for the wife. These results exemplify the trade-off between own consumption, and at the same time leisure and the utility derived from the domestic good. Since husband supplies more hours to the labor market and the wife allocates more hours to housework and leisure activities, the couple follows a pattern of specialization. As the husband's wages start to increase, the opportunity cost of devoting time to housework activities increases. In this context, the husband's income begins to represent a larger fraction of family income.

Figure 1.3: Consumption, Distribution Factors and Bargaining Power

(a) Private Consumption (b) Distribution Factors and Pareto Weight



Notes: The left panel depicts the effect of a change in husband's wage on adult members private consumption. The right panel depicts the effect of a change in husband's wage on the distribution factors and husband's bargaining power. The wage increments go from the first decile to the tenth decile of the husband's wage distribution, while keeping the other explanatory variables constant at their corresponding means.

This translates in higher husband's bargaining power and allows for larger substitution of husband housework time with purchased market inputs as well as wife's housework time. As the husband work more hours there is a rise in income. Some of this income is spent on the inputs for the home produced good, while the residual is allocated to both adult members private consumption. Since the increase in husband's wage implies an increase in his bargaining power, the increase in private consumption benefits the husband more, a phenomenon that can also be seen from the behavior of distribution factors in panel (b) of Figure (1.3).

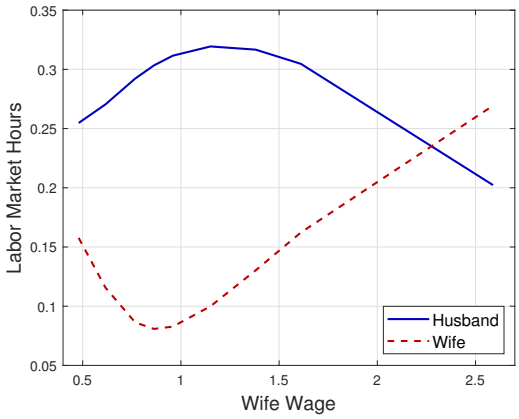
In order to complement the simulation results, I estimate labor supply elasticities defined at the sample median for husbands and wives. Table (A.5) shows that the husband's own wage elasticity is positive, whereas the wife's cross wage elasticity is negative. Finally, the husband's labor supply elasticity with respect to non-labor income is positive.

Effects of a Change in Husband's Wages

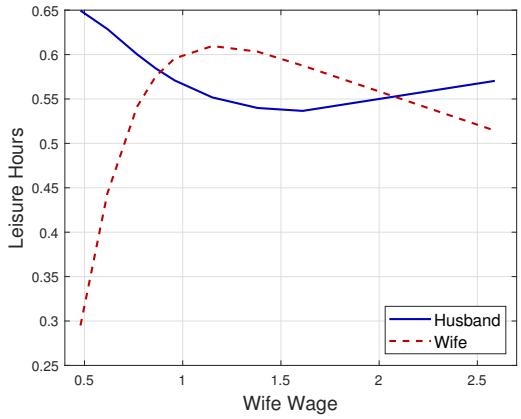
In Figure (1.4), results show that an increase in the wife's wage result in an increase of her leisure initially, followed by a slight decrease in the upper part of the wage distribution. An opposite pattern is observed when we look at the allocation of time in the labor market.

Figure 1.4: Consumption, Distribution Factors and Bargaining Power

(a) Labor Market Hours



(b) Leisure Hours



Notes: The left panel depicts the effect of a change in wife's wage on the choice of adult members time allocation to the labor market. The right panel depicts the effect of a change in wife's wage on the choice of adult members time allocation to leisure activities. The wage increments go from the first decile to the tenth decile of the husband's wage distribution, while keeping the other explanatory variables constant at their corresponding means.

When the wife's wage is low, the wife's time spent on the labor market declines as her wage rises from the low part of the wage distribution, after which it increases as her wage reaches the upper portion of the wage distribution. In this case the income effect dominates the substitution effect in the lower part of the wage distribution, where the reverse effect takes place in the upper portion of the wage distribution. At the same time, there is an initial increase of husband's time spent on the labor market, followed by a slight decrease in the last part of the wage distribution. On the other hand, the effect of an increase in the wife's wage on the husband's allocation of time to leisure, is initially negative, followed by a slight increase in the higher portion

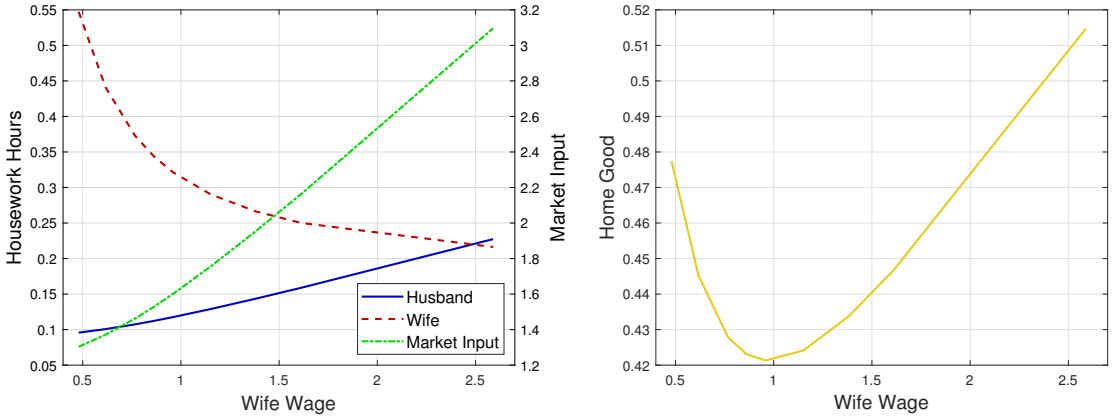
of the wage distribution.

Figure (1.5) shows what happens to the inputs for home good production good as well as the level of home good from an increase in the wife's wage. The wife's time spent on housework activities decreases when her wage increases, while the husband's time spent on housework activities slightly increases, and the household's expenditures on the domestic good also increase. The decrease in the wife's time spent on housework activities is mainly compensated for by the increased expenditures on the domestic good, which leads to an overall increase in the production of the home good.

Figure 1.5: Home Good Production

(a) Home Good Inputs

(b) Quality of Home Good



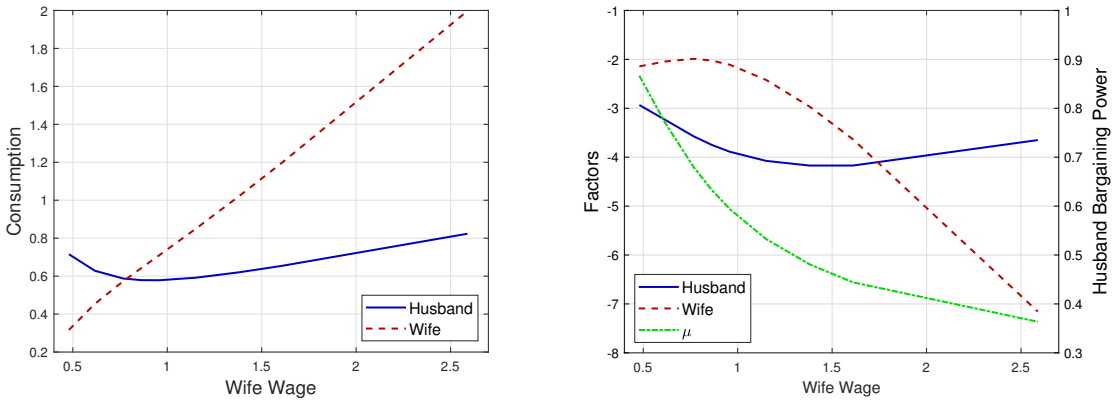
Notes: The left panel depicts the effect of a change in wife's wage on the choice of inputs of home production. The right panel depicts the effect of a change in wife's wage on the production of domestic good. The wage increments go from the first decile to the tenth decile of the husband's wage distribution, while keeping the other explanatory variables constant at their corresponding means.

When the wife's wages are low, she needs to reduce leisure and allocate more hours to the labor market as well as to housework activities. When her wages start to rise, but are still in the low portion of the wage distribution, the couple household is specialized. Based on comparative advantage, the wife devotes more time to housework activities, and devotes less time to paid employment. As the wife's wages keep

increasing, her opportunity cost of devoting time to housework activities or leisure rather than to the labor market starts to increase. This increment in the wife's wages therefore raise the couple's opportunity cost of the home good. This situation makes the wife willing to change her time allocation, so that she devotes less hours to housework activities and more hours to the labor market. The male time devoted to paid employment initially increases as well, and then slightly decreases. This is due to the availability of additional resources for the purchase of the market input of home production due to the fact that the wife is devoting more hours to the labor market, which allows the husband to substitute some labor for leisure.

Figure 1.6: Consumption, Distribution Factors and Bargaining Power

(a) Private Consumption (b) Distribution Factors and Pareto Weight



Notes: The left panel depicts the effect of a change in wife's wage on adult members private consumption. The right panel depicts the effect of a change in wife's wage on the distribution factors and husband's bargaining power. The wage increments go from the first decile to the tenth decile of the husband's wage distribution, while keeping the other explanatory variables constant at their corresponding means.

The two panels of Figure (1.6) show the patterns of private consumption, as well as the distribution factors and husband's bargaining power over the wife's wage distribution. Panel (a) shows that a rise in the wife's wage implies an increase in both spouses' private consumption, however the slopes are different. When wife's wage is low, private consumption of the husband is higher than of the wife. As wife's wages start to rise, her private consumption overtakes the husband's private consumption

and ends up being much more in favor of the wife in the upper portion of the wage distribution. Panel (b), shows how increases in the wife's wage translate into a decrease in the husband's bargaining power. This situation plays an important role in the increase in wife's private consumption, a situation that can also be seen from the behavior of sharing factors.

It is important to note that when the wife's wages are low, the husband will have more bargaining power and will influence more strongly the allocation of resources. As wife's wage start to increase, the household has more income and at the same time the wife has more bargaining power to influence the intra-household allocation of resources. Consequently, the model suggests that when wife's wages are low and start rising, higher opportunity costs become an important driver of the female time allocation decisions. In this context, the income effect is dominated by the substitution effect, and therefore the woman allocates less hours to housework activities. Again, to complement the simulation results, I estimate labor supply elasticities defined at the sample median. Table (A.5) shows that the wife's own wage elasticity and husband's cross wage elasticity are both positive. Finally, the wife's non-labor income elasticity is positive.

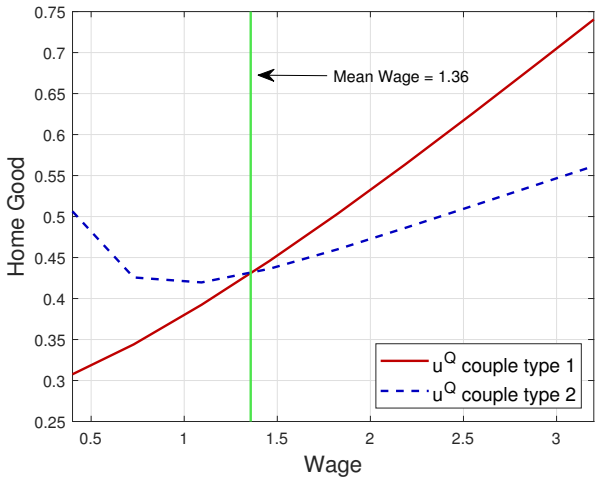
Comparing the Change in Wages on the Production of Home Good

To further examine household specialization, it is useful to compare whether is more beneficial for the production of home good increase in the wage of one of the adult member than an increase in the wage of the other. For the comparison, I consider an average household in which there is violence and is a beneficiary of the cash transfer. This exercise investigates whether better labor opportunities (in terms of better wages) for one adult member of the household are more likely to increase the production of the domestic good than better opportunities to the other member.

In Figure (1.7), the continuous red line displays a scenario of a couple where the wife's wage is fixed to the average wage and the wage of the husband moves over the distribution. Similarly, the blue dotted line represents a scenario in which the husband's wage is fixed to the average wage and the wage of the wife move over the

wage distribution. Consider what happens in cases below the average wage. Starting at a point below the average wage (say 1 dollar), the first scenario (continuous red line) corresponds to situation in which the wage of the wife is fixed to the average wage (1.36 dollars) and the husband's wage is 1 dollar. The second scenario (dotted blue line) corresponds to a situation in which the wage of the husband is fixed to the average wage (1.36 dollars) and the wife's wage is 1 dollar. So, for each point the comparison concerns a situation in which one of the adult household members earns more than the other.

Figure 1.7: Comparison of Wage Changes



Notes: The figure shows a comparison of two scenarios. The first scenario (represented by the red continuous line) characterize a situation in which the wife's wage is fixed to the average wage of the overall sample and the husband wage move over the wage distribution. On the other hand, the second scenario (represented by the blue dotted line) characterize a situation in which the husband's wage is fixed to the average wage of the overall sample and the wife wage move over the wage distribution. The wage increments go from the first decile to the tenth decile of the overall wage distribution, while keeping the other explanatory variables constant at their corresponding means.

Figure (1.7) suggests that home good production is higher in the second scenario. This implies that higher wages for husbands has a larger impact in terms of producing a higher amount of the home good. A similar conclusion holds when comparing couples where the husband has a higher than average wage with a couple where the

wife has a higher than average wage. This corroborates the existence of patterns of specialization.

It is important to acknowledge that the overall effect of changes on wages of adult household members on the production of the home good is the result of the interplay between the intra-household bargaining power, adult member preferences, and the home production process. When there is a change in wages, the bargaining power increases in favor of the household member that experienced the wage increase. Since there is disagreement in preferences, an increase in the bargaining power induced by higher wages results in household choices that are more in line with the preferences of the member with higher bargaining power. Nevertheless, the effect will be contingent on the husband's and the wife's preferences and how they value the home good. There is a clear trade-off of inputs of production. A higher wage increases the opportunity cost of supplying hours to home production. This will shift the intra-household allocation of hours. At the same time, the household receives more income and can increase the expenditure on the market acquired input. Whether higher wages for husbands or wives has positive effect on the production of the home good is determined by the size and direction of the aforementioned mechanisms.

The Role of Violence and Transfers on the Production of Home Good

Recall that in the model transfers will affect the relative power among household members and the non-labor income component of household resources, whereas violence will affect the home good production technology as well as the Pareto weight. Figure (A.5) shows that the level of home good is negatively affected by violence and positively affected by transfers and wages. An increase of 10 percent in the violence index could lead to a 3.3 percentage points reduction in the home good. On the other hand, receiving a transfer could increase the production of the home good by 1.7 percentage points.

1.5.2 Marginal Willingness to Pay for the Home Good

The previous section showed how the production of the home good crucially depends on the husband's and wife's preferences, as well as the available income. The estimation results indicate that spouses have different preferences. Therefore, it is interesting to know whether individual marginal willingness to pay for the home good differs among wives and husbands.

Recall the first stage of the allocation process. Following Blundell, Chiappori and Meghir (2005) and Browning, Chiappori and Weiss (2014), from the first order conditions of this problem it, is possible to obtain:

$$\frac{\partial v^{♂}/\partial \bar{u}^{Q}}{\partial v^{♂}/\partial \rho^{♂}} + \frac{\partial v^{♀}/\partial \bar{u}^{Q}}{\partial v^{♀}/\partial \rho^{♀}} = g\left(w^{♀}, w^{♂}\right) \tag{1.31}$$

this is a standard Bowen-Lindahl-Samuelson condition for the optimal provision of the public good within the household. As in Browning, Chiappori and Weiss (2014), the left-hand side of Equation (1.31) is the sum of husband's and wife's marginal rates of substitution between the domestic good and the private good, while the right-hand side gives the price ratio for the two goods.[22] As Browning, Chiappori and Weiss (2014) explains this relies in the idea that decisions regarding public commodities can be decentralized using agent-specific prices. When a good is private, all agents face the same price and choose different quantities; with public goods, they all consume the same quantity but would be willing to pay different marginal prices for it.

Equation (1.31) provides the expression for obtaining the individual marginal willingness to pay (MWP) for the public good. If we insert Equations (1.23) and (1.24) into Equation (1.25), the Bowen-Lindahl-Samuelson condition can be rewritten as:

$$\frac{-\alpha_2^{♂}\left(w^{♂} + \rho^{♂}\right)\ln w^{♂}}{\bar{u}^{Q}} + \frac{-\alpha_2^{♀}\left(w^{♀} + \rho^{♀}\right)\ln w^{♀}}{\bar{u}^{Q}} = g\left(w^{♀}, w^{♂}\right) \tag{1.32}$$

where the individual MWP for $(i = ♀, ♂)$ equals:

$$MWP^{i} = \frac{-\alpha_2^{i}\left(w^{i} + \rho^{i}\right)\ln w^{i}/\bar{u}^{Q}}{g\left(w^{♀}, w^{♂}\right)} \tag{1.33}$$

[22] Recall that the price of the private good has been normalized to one.

This represents the maximum amount each adult member would be willing to pay to acquire an additional unit of public good, if the amount was to be withdrawn from each individual consumption of the private good. Using the estimated parameters of the intra-household bargaining model, I calculate the husband's and wife's MWP for the home good. Table (1.2) show the results of the average MWP for the home good for each adult member in the household.

Table 1.2: Husband and Wife Marginal Willingness to Pay (MWP)

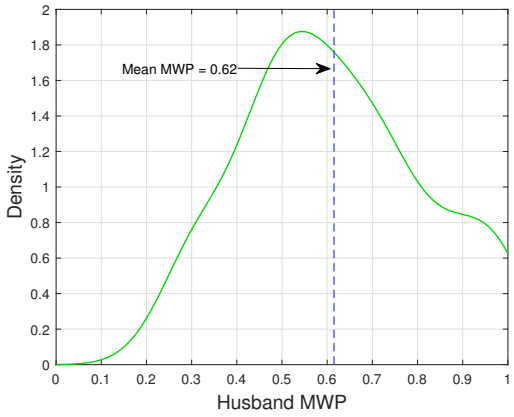
	$MWP^{\male}$	$MWP^{\female}$	Difference [p-value]
	0.615***	0.385***	0.230***
	(0.012)	(0.012)	[0.000]
Observations	276	276	552

Notes: The table presents the average marginal willingness to pay for the public good for each member of the couple as well as the difference between husband and wife. Standard errors in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%.

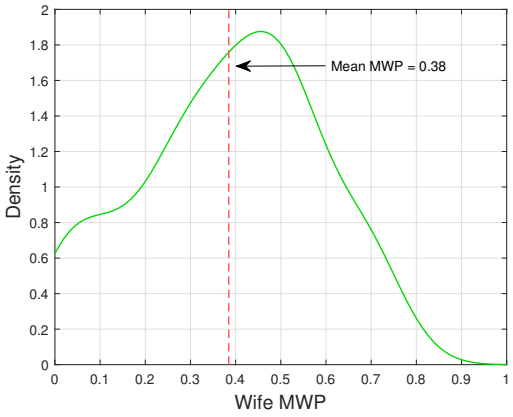
Table (1.2) shows the results of the calculations of individual average MWP for the home good. The average MWP is higher for men and the difference between men's and women's MWP is statistically different from zero at 1 percent level of significance.

Figure 1.8: Individual Marginal Willingness to Pay for the Public Good

(a) Husband's Marginal Willingness to Pay



(b) Wife's Marginal Willingness to Pay



Notes: The figure shows the distribution of the marginal willingness to pay for husbands and wives.

In Figure (1.8), I show the distribution of the husband's and wife's MWP. Clearly, the plot for women is a mirror graph of that of men. We can observe that there is variation in the individual MWP of women and men, with more mass to the left of 0.5 for husbands and correspondingly with more mass to the right of 0.5 for wives.

Table (1.11) shows the average MWP for the home good disaggregated by type of household. There four types of household depending whether there is intimate partner violence and whether they receive the cash transfer. In all the cases, the average MWP is higher for husbands, and all these differences are statistically significant. The results show that the highest difference in the MWP among adult members is in household where there are no transfers and there exists intimate partner violence.

Each adult member's marginal willingness to pay for the home good consists of a combination of parameters related to preferences, and to income and prices. Therefore, the difference in MWP between the husband and the wife can be disentangled in the contribution of preferences, on the one hand, and the contribution of elements related to income and prices on the other. This difference in MWP between the husband and the wife (scaled by the level of the home good) can be expressed as:

$$\Delta_{MWP} \times \bar{u}^{Q} = \Delta_{|\alpha_2^i|} \frac{\sum\limits_{i=♂,♀} (w^i + \rho^i) \ln w^i}{2 \times g\left(w^{♀}, w^{♂}\right)} + \Delta_{(w^i+\rho^i)\ln w^i} \frac{\sum\limits_{i=♂,♀} |\alpha_2^i|}{2 \times g\left(w^{♀}, w^{♂}\right)} \tag{1.34}$$

In Equation (1.34), any Δ_y represents the difference between husband's and wife's elements and is given by $\Delta_y = y^{♂} - y^{♀}$. Using Equation (1.34), the magnitude of the contribution of the preferences, and income and prices to the difference in the adult member's MWP for the home good, can be obtained by taking the absolute value of the first and second term, respectively.

Table 1.3: Decomposition of the Contributions to the Marginal Willingness to Pay

	Preferences	Income and Prices
	0.399	0.601
	(0.013)	(0.013)
Observations	276	276

Notes: The table presents the decomposition of the marginal willingness to pay for the home good among preference component and income and prices component .

Table (1.3) provides the results from the decomposition calculations. On average, 40 percent of the difference in MWP for the home good among spouses is explained by the difference in the preference parameters, while 60 percent is explained by differences in income and prices.

1.6 Implications for Poverty and Inequality

Standard poverty measures in developing countries typically use per-capita calculations as an approximation to quantify poverty. This approach ignores the intra-household distribution of resources, the gains from joint consumption and the potential inequality among household members. In this section, I calculate the share of total resources allocated to each member of the household resulting from the estimation of the intra-household collective model. These resource shares are used to

compute individual poverty rates for adult household members, as well as indices of inequality.

1.6.1 Poverty

First, I calculate the poverty rate in the typical way, i.e. the poverty rate is defined as the percentage of population whose income falls below the poverty line, which is defined as 60 percent of the median full income in the sample of households used in this study. This approach ignores intra-household inequalities. This is a standard measure of relative poverty.[23] Also, the data set consists of couples where both spouses participate in the labor market, and so the poverty line will be higher than a line based on data that includes households containing an unemployed, retired or disabled spouse. In this framework, children are taken into consideration in the domestically produced good.[24] To make total household income comparable across approaches, it is assumed that each adult within the household amounts to one equivalent adult.

The second approach is based on a linear consumption technology a la Barten. This approach is commonly used in standard collective household models, which estimates economies of scales by a linear consumption technology (see Dunbar, Lewbel and Pendakur 2013; Lewbel and Pendakur 2008). This estimation of individual income does not allow individual shadow prices for joint consumption within a couple to differ (Browning, Chiappori and Lewbel 2013; Cherchye et al. 2019). Using a linear consumption technology a la Barten has the consequence that, in equilibrium, the individual shadow prices for shared consumption are the same for different household members. This implies that the public good (shared consumption) contributes to individual income in the same way for both members of the couple. I evaluate individual income by assigning to each member half of the expenditures on the home-produced public good. This technology, together with Pareto efficiency assumption implies that both members have the same willingness to pay (shadow price) for the home-produced good. The implication in terms of calculation of incomes is that shared consumption

[23] This type of measure is used in the definition of OECD poverty rates.

[24] Children's welfare then acts as a public good, which is characterized as a domestic good that is produced by means of expenditures on children and parental time invested in children.

of the home-produced good contributes the same to the individual income of both adult members.

However, assuming that different members have the same evaluation for joint consumption is not truly realistic. The third approach allows individuals to have different willingness to pay for the home-produced good. By allowing the individual evaluation of joint consumption to affect the estimation of individual income, it is possible to estimate a different measure of individual income that allows one to document intra-household inequalities (see Cherchye et al. 2018; Browning, Chiappori and Weiss 2014; Lise and Seitz 2011). For example, if the MWP is higher for one of the members of the household, using Barten scales, underestimate the evaluation of individual income of this member and overestimates the evaluation of individual income of the other member of the household. I estimate individual incomes relaxing the assumption of equal individual shadow prices for joint consumption. This implies that each adult member values joint consumption differently.[25] Joint consumption is modelled as a home produced public good to get an evaluation of individual income. In the previous section, I showed that by dividing consumption into private and public expenditure and making use of the Bowen-Lindahl-Samuelson condition for the optimal provision of public goods, it is possible to estimate the individual MWP (i.e. Lindahl prices) for he home good (Cherchye et al. 2018; Browning, Chiappori and Weiss 2014). Using these individual shadow prices, it is possible to estimate the third measure of individual income.

We can express each of the approaches as:

$$\begin{aligned} Y_1^i &= \frac{c^{\female} + c^{\male} + g\left(w^{\female}, w^{\male}\right) u^Q}{2} \\ Y_2^i &= c^i + 0.5 \times \left[g\left(w^{\female}, w^{\male}\right) u^Q\right] \\ Y_3^i &= c^i + MWP^i \times \left[g\left(w^{\female}, w^{\male}\right) u^Q\right] \end{aligned} \tag{1.35}$$

[25]The intuition behind this is that each of the individuals within the household must consume the same amount of public good, thus individuals cannot equalize their marginal rates of substitutions to the common relative price. If consumption of the good must be the same is it possible to vary prices to get efficiency.

for ($i = ♀, ♂$). The distribution of income for husbands and wives using these three measures is displayed in Equation (1.35). Using these income measures, Table (1.4) presents the of incidence of poverty disaggregated for husbands and wives.

Table 1.4: Individual Poverty

	Equivalence scales	Equal prices	Individual prices
Global	0.326	0.322	0.428
Husband [♂]	0.326	0.329	0.308
Wife [♀]	0.326	0.315	0.547
Difference	-	0.014	0.239***
Husband's Contribution (%)	50.00	51.12	36.02
Wife's Contribution (%)	50.00	48.88	63.98
Observations	552	552	552

Notes: This table shows the incidence of poverty at the individual level. These indicators are constructed using the income definitions on Equation (1.35) and the model estimates obtained from the structural model. An individual is characterized as poor if her/his income share falls below the individual poverty line.

Using equivalence scales to measure poverty, by definition ignores within-household inequalities, and therefore there is no difference among husbands and wives in the level of poverty. Using the second approach (a la Barten), the level of poverty is 1.4 percentage points higher for husbands than for wives, however this difference is not statistically significant. This calculation is based on the assumption of equal marginal willingness to pay for the home good for the two adult members. Table (1.2) showed that MWP for the home good for husbands was higher than for wives.[26] In the last column of Table (1.4), I take into consideration this difference by applying individual prices when calculating the incidence of poverty. Results show that ignoring the

[26]This means that men are more likely to exchange one unit of their own private consumption in order to produce and additional unit of home-produced public good. This respond to the fact that men face different shadow prices and have more income than women, and therefore they are able to consume more of the public good.

marginal willingness to pay for the home good among adult household members could have important effects on the estimation of poverty. Accounting for the heterogeneity in the MWP shows that women are substantially poorer than men. Poverty is more than 23 percentage points higher for wives than for husbands under this approach.

Disaggregation of poverty rates by type of household is presented in Table (1.12). Results suggest important variability in the measures of poverty among the different types of households. Differences among wives and husband individual poverty are statistically significant in all types of households. The larger difference in poverty rates between men and women appear to be in households that do not receive the transfers and where there is violence. In this type of household, poverty is about 30 percentage points higher for wives than for husbands. I also find that households where there is intimate partner violence exhibit larger gender poverty gaps (between 29 and 30 percentage points) compared to households where there is no violence (between 15 to 28 percentage points). Furthermore, transfers are more effective in mitigating this gender gap on households where there is no violence (around 13 percentage points gap reduction).

These results suggest that the policy intervention generated welfare gains in terms of reducing overall and individual poverty. However, these welfare gains are heterogeneous among the different types of households. Particularly, Table (1.12) shows that transfers are effective in reducing the gender poverty gap mainly in households where there is no violence. Using the estimated parameter from the second specification that takes into consideration the potential effect of the transfer on violence provides similar results, however the magnitude of the effects are somewhat different (see Table (A.7)). The results are similar as in the baseline model–transfers are effective in reducing the gender poverty gap mainly in households where there is no violence, however, the magnitude of the reduction is around 10 percentage points in this case.

Clearly, the transfer increases the available resources within the household. Under a scenario with transfers and without violence, there is an increase in the bargaining power of the woman, allowing her to align household allocations with her preferences. Since there is no violence, the increase of the woman's consumption is larger than the increase in man's consumption. Therefore, households of this type experience

a larger reduction on women's incidence of poverty and a reduction in the gender poverty gap compared to households with no violence and without transfers. On the other hand, in a scenario with transfers and with violence, there is an increase in the bargaining power of the man, allowing him to align household allocations with his preferences. This increase in the man's bargaining power could be partially offset by the transfer. Moreover, when there is violence the man could appropriate partially or fully the additional resources coming from the transfer. The results indicate that in households with transfers and violence, the increase in the woman's consumption is very small compared to the increase the man's consumption. Therefore, the man takes most of the additional resources. Consequently, households of this type do not experience a reduction in women's incidence of poverty and the reduction in the gender poverty gap is minimal (or even increases) compared to households with violence and without transfers.

Therefore, in terms of policy implications, governments aiming in improving the well-being of women should take into consideration the potential factors that could make these types of programs unsuccessful and complement the policy interventions with mechanisms that account for these perverse factors that reduce the effectiveness of the program. These could be done by introducing simple questions that reveal the presence of intimate partner violence in the surveys used to classify potential beneficiaries of the program.

1.6.2 Inequality

The results in the previous section suggested differences in individual income among husbands and wives on the different types of households. This situation could have effects on the measurement of inequality. The level of income inequality is calculated using the Gini index and concentration curves.[27] Table (1.5) reports the Gini index for the sample of the model for the different income measures.

[27]These are widely used tools for the analysis of economic inequality and redistribution.

Table 1.5: Measures of Income Inequality

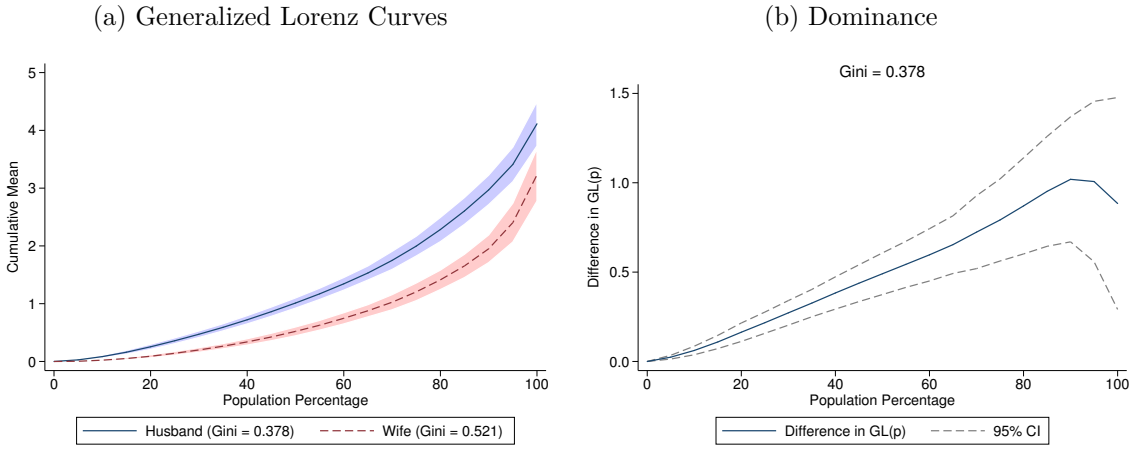
	Equivalence scales	Equal prices	Individual prices
	0.367	0.368	0.454
Observations	552	552	552

Notes: This table shows the level of inequality measured by the Gini coefficient. These indicators are constructed using the income definitions on Equation (1.35) and the model estimates obtained from the structural model.

Taking into consideration differences in individual MWP in the measurement of income turns out to have an important effect on the level of income inequality. Comparing the three measures, income inequality is highest under the individual prices' methodology, with a Gini index of 0.454. This represents a difference of more than 8 points relative to the other methodologies.

Next, I analyze inequality using the income definition under the third methodology (individual prices). Using this measure, I compare inequality between husbands and wives. Figure (1.9) shows the generalized Lorenz curves for wives and husbands using the third measure of income. These curves represent the relationship between the cumulative individual income and the proportion of population, where individuals are ordered in ascending order of income. I observe that the generalized Lorenz curve of husbands under equal prices is always above the curve for wives. To evaluate welfare ordering, it is useful to analyze generalized Lorenz dominance. In the panel (b) of Figure (1.9), I evaluate whether one distribution dominates the other. It is very clear from the plot, that the income distribution of husbands generalized Lorenz dominates the income distribution of wives.

Figure 1.9: Generalized Lorenz Curves by Adult Household Members



Notes: The figure shows generalized Lorenz curves for husbands and wives for the measures of individual income that takes into consideration individual prices (different MWP).

I have also calculated measure of inequality for the different types of households. Results in Table (1.13) suggest that, under individual prices, households that do not receive the transfer and have partner violence exhibit the highest overall income inequality (an income Gini coefficient of 0.469).[28] Finally, in Figure (A.7), I plot generalized Lorenz curves for husbands and wives in the different households. In all cases the generalized Lorenz curve of husbands (under individual prices) is above the curve for wives. This implies that in all the different types of households women's income inequality is higher compared to men's income inequality. Moreover, Figure (A.7) suggest that: (i) households that receive the transfer exhibit lower levels of women's inequality, (ii) households that receive the transfers and have violence show higher levels of women inequality compared to the households that receive the transfer and have no violence, and (iii) households that do not receive the transfer and have no violence exhibit almost the same levels of women inequality compared to the households that do not receive the transfer and have violence.

[28]Using the other measures of income shows a similar result, although with different magnitudes (Gini index of 0.388 and 0.389, respectively).

1.6.3 Indifference Scales

Indifference scales measure how much income an individual living alone needs to have in order to be as well off as when living with a couple with some given household income. Since the utility level of the same individual is compared for two different living arrangements, indifference scales are not affected by the particular cardinal representation of the individual preferences. Thus, they do not involve any interpersonal utility comparisons. Naturally, one needs to assume that individual preferences do not change when moving from one living arrangement to another.

The first type of indifference scales follows Browning, Chiappori and Lewbel (2013) and Cherchye, De Rock and Vermeulen (2012). In the calculation of this type of indifference scale, it is assumed that home production technology is the same in the two living arrangements, time inputs of the partner become zero when living alone and there is no restriction on the level of the home-produced good in the new state. Then, indifference scales are given by:

$$is^{♂}_{type1} = \frac{\min\limits_{c^{♂*},c^{Q*},l^{♂*},h^{♂*}} \left(\begin{array}{c} c^{♂*} + c^{Q*} + w^{♂}\left(l^{♂*} + h^{♂*}\right) \\ s.t. \quad u^{♂}\left(c^{♂*}, l^{♂*}, u^{Q}\left(c^{Q*}, h^{♂*}, 0\right)\right) = \\ u^{♂}\left(c^{♂}, l^{♂}, u^{Q}\left(c^{Q}, h^{♂}, h^{♀}\right)\right) \end{array} \right)}{w^{♀} + w^{♂} + y + t} \tag{1.36}$$

$$is^{♀}_{type1} = \frac{\min\limits_{c^{♀*},c^{Q*},l^{♀*},h^{♀*}} \left(\begin{array}{c} c^{♀*} + c^{Q*} + w^{♀}\left(l^{♀*} + h^{♀*}\right) \\ s.t. \quad u^{♀}\left(c^{♀*}, l^{♀*}, u^{Q}\left(c^{Q*}, 0, h^{♀*}\right)\right) = \\ u^{♀}\left(c^{♀}, l^{♀}, u^{Q}\left(c^{Q}, h^{♂}, h^{♀}\right)\right) \end{array} \right)}{w^{♀} + w^{♂} + y + t} \tag{1.37}$$

The numerators of Equations (1.36) and (1.37) represents the minimum expenditures needed for member ($i = ♀, ♂$) living alone to reach the same indifference curve as when they would live in a couple with the initial commodity bundle $(c^i, c^Q, l^i, h^{♂}, h^{♀})$, respectively. The denominator is equal to the couple's full income in the initial household situation. Table (1.6) shows numerically estimated indifference scales for different types of households.

It is important to clarify that some indifference scales are not defined. This is related to the time restriction and the dependence of individual utilities on the home-produced good that is produced within the household. In a situation in which one partner leaves the household, the limited time that is available to the individual is not enough to produce the same level of utility—which includes the home-produced good—as in the initial scenario when the individual is within a couple. Living together allows for economies of scale, which is related to the public home good that each adult member consumes. If the economies of scale are very high the individual in the new scenario (living alone) could experience an important utility loss in any circumstance.

Table 1.6: Approach 1: Indifference Scales

		No Violence		Mean Violence		3rdQ Violence	
		Husband [♂]	Wife [♀]	Husband [♂]	Wife [♀]	Husband [♂]	Wife [♀]
	Full Income						
No	1Q	0.606	0.655	0.598	0.625	0.583	0.583
Transfer	Median	0.619	0.669	0.610	0.634	0.592	0.592
	3Q	0.636	0.684	0.625	0.648	0.602	0.603
	1Q	0.587	–	0.580	0.682	0.566	0.602
With	Median	0.700	–	0.592	0.678	0.575	0.609
Transfer	3Q	0.656	–	0.608	0.679	0.586	0.620

Notes: Indifference scales were numerically calculated. In this case, the calculation keep the spouses' utility constant across both living arrangements. The empty cells reveal that the scale cannot be calculated without violating an individual time constraint.

Table (1.6) shows that husband's indifference scales oscillate around 0.57 and 0.7, whereas wife's indifference scales oscillate around 0.58 and 0.68. Therefore, using this type of indifference scales, the husband would need at least about 57 percent of

the initial household resources to be as well off when living alone, and the wife would need at least about 58 percent of the initial household resources to be as well off when living alone. In Table (1.6), it is noticeable that indifference scales increase (decrease) for wives (husbands) when a household is a beneficiary of the transfer and decreases for both adult members when there is an increase in the level of violence. This could be explained by the fact that transfers and violence shift the bargaining power of the husband and wife, which produce a reallocation in the control of resources. This together with the inherent destruction of home good, due to violence, and the fact that the transfer provides additional resources explains this heterogeneous results . Finally, it is noticeable that indifference scales increase with the household's level of full income.

The second type of indifference scales accounts for the effects of public consumption in case a couple dissolves. The calculation in this case impose some restrictions: the single spouse's time spent on home work stays the same as in the initial situation, and a share of the initial time spent on home work by the now absent partner remains available in the new regime. Then, u^Q is maintained at the same level as in the initial situation by increasing the expenditures on the domestic goods, to compensate for the decreased time inputs of the absent partner. Assuming that production technologies are the same in the two living arrangements, indifference scales is given by:

$$is^{♂}_{type2} = \frac{\min\limits_{c^{♂*},l^{♂*}} \left(\begin{array}{cc} & c^{♂*} + c^{Q}_{u^Q} + w^{♂}\left(l^{♂*} + h^{♂}\right) + w^{♀}\left(\tau h^{♀}\right) \\ s.t. & v^{♂}\left(w^{♂}, \rho^{♂*}, u^Q\right) = v^{♂}\left(w^{♂}, \rho^{♂}, u^Q\right) \end{array} \right)}{w^{♀} + w^{♂} + y + t} \tag{1.38}$$

$$is^{♀}_{type2} = \frac{\min\limits_{c^{♀*},l^{♀*}} \left(\begin{array}{cc} & c^{♀*} + c^{Q}_{u^Q} + w^{♀}\left(l^{♀*} + h^{♀}\right) + w^{♂}\left(\tau h^{♂}\right) \\ s.t. & v^{♀}\left(w^{♀}, \rho^{♀*}, u^Q\right) = v^{♀}\left(w^{♀}, \rho^{♀}, u^Q\right) \end{array} \right)}{w^{♀} + w^{♂} + y + t} \tag{1.39}$$

In Equations (1.38) and (1.39), $c^{Q}_{u^Q}$ represents the necessary level of expenditures on the domestic goods in order to keep u^Q at the same level as in the initial situation and τ is the share of partner's time that is taken over in the new situation. Table

(1.7) show the results of the estimates of the second type of indifference scales for the same type of households considered before.

Recall that this type of indifference scale does not have the time constraint problem since it has been assumed a level of time spent on the domestic goods by the absent spouse. Results show that the husband needs between 80 and 89 percent of the initial household resources to be as well off as in a couple. On the other hand, women require between 71 and 78 percent of the initial household resources to be as well off as in a couple. These numbers are larger than the numbers obtained using the first type of indifference scale. The explanation is that we here impose a constant level of the domestic goods.Results indicate that partner violence have different effects on the amount of necessary resources that husbands and wives need when leaving the partnership to be as well off as in a couple.

Table 1.7: Approach 2: Indifference Scales

		No Violence		Mean Violence		3Q Violence	
		Husband [♂]	Wife [♀]	Husband [♂]	Wife [♀]	Husband [♂]	Wife [♀]
	Full Income						
No	1Q	0.812	0.735	0.820	0.725	0.836	0.708
Transfer	Median	0.839	0.753	0.846	0.743	0.861	0.725
	3Q	0.872	0.776	0.878	0.765	0.889	0.746
With	1Q	0.796	0.749	0.804	0.739	0.820	0.722
Transfer	Median	0.849	0.745	0.830	0.757	0.845	0.738
	3Q	0.881	0.769	0.862	0.778	0.874	0.759

Notes: : Indifference scales were numerically calculated. In this case, the calculation keep the spouses' utility as well as the output of the domestic goods constant across both living arrangements.

The intuition behind this result is that violence increases the husband's bargaining

power and shifts the household allocation towards the husband's preferred allocation. At the same time, violence generates a reduction in the level of the domestic good due to the effect in the total factor productivity of the home production technology. Specifically, we observe that indifference scales for husbands (wives) increase (decrease) with violence. Receiving a transfer also has different effects on the amount of resources that husbands and wives require when leaving the partnership to be as well off as in a couple. In this case, the intuition is that transfers increase the wife's bargaining power and shift the household allocation towards the wife's preferred allocation. Simultaneously, transfers increase the amount of available resources for private and public consumption. Specifically, indifference scales increase (decrease) for wives (husbands) when the household receives a transfer. Finally, as before, indifference scales increase when there is higher household income.

1.7 Conclusion

In the present chapter, I study how different types of households determine adult members' allocations of time and consumption. Using a collective intra-household decision making model and data from a randomized control trial intervention that provided cash transfers to families in Ecuador in 2011, I estimate the parameters of the model. My estimates show that spouses' preferences, to a large degree, depend on the consumption of the home-produced good. I also find that adult members' bargaining power is significantly influenced by individual wages, non-labor income, the probability of receiving a cash transfer, and presence of violence in the household. Further, my estimates allow me to calculate the amount of resources controlled by each individual within the household. I use three measures of income: the widely used equivalence scales measure; a measure that assumes a linear consumption technology a la Barten, and a measure that accounts for the individual marginal willingness to pay for the home good. Using this information, I provide two policy insights.

First, I conduct a poverty analysis at the individual level, and show that there is a significant difference in the level of resources that husbands and wives control among the different types of households. This translates into heterogeneity in the incidence

of poverty for men and women contingent on the type of household. The results show that women are substantially poorer than men, that households characterized by violence exhibit larger gender poverty gaps and that transfers partially reduce this gender gap. These results suggest that the policy intervention generated welfare gains in terms of reducing overall and individual poverty. However, these welfare gains are heterogeneous among the different types of households. In terms of inequality, the results indicate that income distribution is more unequal for women than for men. However, households that receive the transfer exhibit lower levels of women's inequality.

Second, I estimate indifference scales for the different types of households as proposed by Browning, Chiappori and Lewbel (2013). Results reveal that husbands need a higher level of resources when living alone to be as well-off as when living as a couple. This suggests that husbands had a larger share of benefit than wives when living with their wives. Moreover, the type of household affects the level of income that each partner needs when living alone. For example, I find that indifference scales for women decrease with violence and increase when the household is a beneficiary of the transfer.

Finally, further research should take into consideration two possible extensions. One will be to endogenize violence and try to understand the negative externalities in terms of utility shifts that these phenomena could cause. The other is to try to integrate non-participation in employment. This will help to improve the sample power for the analysis, especially in the context of developing countries, where a considerable number of women do not participate in the labor market.

Table 1.8: Baseline Descriptive Statistics of Household Characteristics by Intervention Arm

	Control[a]	Treatment[b]	Difference[a−b] P-values
Male age	39.20	38.41	0.34
Female age	35.29	34.69	0.44
Couple age difference	3.91	3.72	0.70
Male hours on domestic work (day)	1.82	1.93	0.23
Female hours on domestic work (day)	7.52	7.23	0.41
Male hours on market work (day)	6.75	6.62	0.58
Female hours on market work (day)	5.68	5.05	0.13
Male wage ($ per hour)	1.74	1.61	0.55
Female wage ($ per hour)	1.29	1.72	0.35
Male private consumption	32.32	28.83	0.23
Female private consumption	32.02	30.10	0.52
Public expenditure (inc. children)	328.07	319.23	0.65
Female secondary education	0.38	0.39	0.86
Male secondary education	0.36	0.39	0.43
Married	0.42	0.43	0.82
Indigenous	0.03	0.04	0.53
Afro-Ecuadorian	0.06	0.07	0.65
Sole owner of house	0.04	0.05	0.44
No. children form 0 to 5	0.72	0.76	0.51
No. children form 6 to 15	1.02	0.87	0.05
Lifetime physical and or sexual violence	0.33	0.35	0.63
Controlling behaviors	0.17	0.17	0.87
Emotional violence	0.24	0.27	0.36
Physical and or sexual violence	0.12	0.18	0.05

Notes: The table shows a set of important characteristics of the households used for the analysis. P-values are reported from Wald tests on the equality of means of Treatment and Control for each variable. Standard errors are clustered at the cluster level.

Table 1.9: Estimates of the Impact of the Program over the Allocation of Time

	(1)	(2)	(3)	(4)	(5)	(6)
	Housework Hours	Housework Hours	Work Hours	Work Hours	Leisure Hours	Leisure Hours
	Women					
Transfer						
Any	0.717***		0.0193		-0.624**	
	(0.261)		(0.487)		(0.295)	
Cash		0.658**		0.148		-0.636*
		(0.308)		(0.569)		(0.347)
In-kind		0.748***		-0.051		-0.618**
		(0.284)		(0.530)		(0.308)
	(7)	(8)	(9)	(10)	(11)	(12)
	Housework Hours	Housework Hours	Work Hours	Work Hours	Leisure Hours	Leisure Hours
	Men					
Transfer						
Any	0.216		0.282		-0.289	
	(0.155)		(0.190)		(0.194)	
Cash		0.094		0.185		-0.141
		(0.201)		(0.258)		(0.253)
In-kind		0.278*		0.332*		-0.366*
		(0.162)		(0.200)		(0.209)
Controls	✓	✓	✓	✓	✓	✓
Clusters	145	145	145	145	145	145
N	1,242	1,242	1,242	1,242	1,242	1,242

Notes: The table shows the estimated effect of receiving the program on time allocation to housework, paid work and leisure activities for women and men head or spouse within the household. Tobit models are used to estimate impacts on time allocation. Standard errors in parentheses are clustered at the cluster level. *significant to 10%; **significant to 5%; ***significant to 1%.

Table 1.10: Estimates of the Impact of the Program over Consumption

	(1)	(2)	(3)	(4)	(5)	(6)
	Private Consumption	Private Consumption	Private Consumption	Private Consumption	Public Consumption	Public Consumption
	Women		Men		Household	
Transfer						
Any	0.0230		-0.0392		0.359***	
	(0.0366)		(0.0419)		(0.112)	
Cash		0.00408		-0.0662		0.352**
		(0.0476)		(0.0500)		(0.137)
In-kind		0.0328		-0.0252		0.362***
		(0.0391)		(0.0456)		(0.121)
Controls	✓	✓	✓	✓	✓	✓
Clusters	145	145	145	145	145	145
N	1235	1235	1235	1235	1235	1235

Notes: The table shows the estimated effect of receiving the program on consumption. Tobit models are used to estimate impacts on private consumption due to the important fraction of households that have zero adult private consumption. Standard errors in parentheses are clustered at the cluster level. *significant at 10%; **significant at 5%; ***significant at 1%.

Table 1.11: Husband and Wife Marginal Willingness to Pay (MWP)

	$MWP^{\male}$	$MWP^{\female}$	Difference [p-value]
Overall			
	0.615	0.385	0.230***
	(0.012)	(0.012)	[0.000]
No Transfer and No Violence			
	0.593	0.407	0.186***
	(0.037)	(0.037)	[0.000]
Transfer and No Violence			
	0.609	0.391	0.220***
	(0.021)	(0.021)	[0.000]
No Transfer and Violence			
	0.637	0.363	0.273***
	(0.028)	(0.028)	[0.000]
Transfer and Violence			
	0.618	0.381	0.236***
	(0.020)	(0.020)	[0.000]

Notes: The table presents the average marginal willingness to pay for the public good for each member of the couple as well as the difference between husband and wife. Standard errors in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%.

Table 1.12: Individual Poverty by Household Type

	Equivalence scales	Equal prices	Individual prices
Overall			
Global	0.326	0.322	0.428
Husband [♂]	0.326	0.329	0.308
Wife [♀]	0.326	0.315	0.547
Difference	–	0.014	0.239***
No Transfer and No Violence			
Global	0.414	0.414	0.517
Husband [♂]	0.414	0.414	0.379
Wife [♀]	0.414	0.414	0.655
Difference	–	–	0.276**
Transfer and No Violence			
Global	0.306	0.311	0.408
Husband [♂]	0.306	0.316	0.338
Wife [♀]	0.306	0.306	0.479
Difference	–	0.010	0.143**
No Transfer and Violence			
Global	0.349	0.325	0.407
Husband [♂]	0.349	0.349	0.256
Wife [♀]	0.349	0.302	0.558
Difference	–	0.047	0.302***
Transfer and Violence			
Global	0.311	0.306	0.429
Husband [♂]	0.311	0.311	0.283
Wife [♀]	0.311	0.301	0.575
Difference	–	0.009	0.292***

Notes: Indicators are constructed using Eq. (1.35) and model estimates from the structural model. An individual is characterized as poor if her/his income share falls below the individual poverty line.

Table 1.13: Measures of Income Inequality by Household Type

	Equivalence scales	Equal prices	Individual prices
Overall	0.367	0.368	0.454
No Transfer and No Violence	0.396	0.399	0.465
Transfer and No Violence	0.354	0.356	0.447
No Transfer and Violence	0.388	0.389	0.469
Transfer and Violence	0.350	0.352	0.446

Notes: This table shows the level of inequality measured by the Gini coefficient disaggregated by the types of household. These indicators are constructed using the income definitions on Equation (1.35) and the model estimates obtained from the structural model.

Chapter 2

Conditional Cash Transfers, Household Time Allocation and Bargaining Power: The Human Development Bonus in Ecuador

2.1 Introduction

The main reason many governments in developing countries implement Conditional Cash Transfer (CCT) programs is to alleviate poverty by boosting the incomes of the poor. Over the last twenty years, these types of safety net programs have become an increasingly important part of the social policy in many Latin American countries and have expanded to multiple developing countries around the world.[1] By influencing the amount of resources available to poor households, these programs are intended to promote desirable social outcomes such as better childhood education and health, productive activities and gender empowerment. To attain these goals, most countries that have launched CCT programs have stipulated that the beneficiary of the transfer has to be the female head or the spouse of the male head of a household. This recurrent feature is based on the assumption that women care more about children's education and health, and therefore, an increase in the economic resources controlled by the woman in the household will translate into a higher women's bargaining power, leading to better outcomes for the woman's children.[2]

However, this targeting mechanism poses some questions that remain unanswered and, thus, require further analysis. A gender-based CCT could have unintended effects such as behavioral changes in terms of intra-household time use (allocation of time) and intra-household distributional effects (bargaining power). The aim of this paper is to contribute towards filling this gap in the literature by studying individuals in households that consist of married couples and analyzing the extent to which a CCT program in Ecuador that is targeted to women—*Bono de Desarrollo Humano* (Human Development Bonus, BDH)—affects time use and bargaining power of both

[1] In Latin America, CCT programs were launched in 1995 in Brazil, followed by Mexico in 1997. Soon after, many other Latin American and Caribbean countries, such as Argentina, Chile, Colombia, Costa Rica, Ecuador, Honduras, Jamaica, Nicaragua and Uruguay, also implemented these types of social assistance programs. Currently, there are over 40 countries around the world where this type of social policy have been adopted (Fiszbein et al., 2009)

[2] There is an important body of empirical literature that shows the positive effect of CCT programs on outcomes such as school attendance, health, and child nutrition (see, for instance, Gertler 2004; Behrman, Sengupta and Todd 2005; Paxson and Schady 2010). Also, Thomas (1990), Duflo (2003), Duflo (2012) and Doepke and Tertilt (2011) are important studies on intra-household resource allocation and female empowerment.

members of the couple within the household. Specifically, this paper studies the impact of the program on women's and men's hours devoted to paid work, housework, community activities and leisure. In the same vein, it studies whether resource transfers to women through the BDH program are effective in improving women's positions within the household, as measured by several questions about their decision-making power. I find that the cash transfer affects women's allocation of time, but it does not affect the allocation of time of men and does not influence women's say in certain dimensions of intra-household decisions. By examining these behavioral responses of couples within households to the CCT program, this paper provides a better picture of different consequences that CCT programs might have, which could have important implications for designing new policies

With the rise in popularity of CCT programs and the introduction of these policies across many developing countries, much effort has been devoted to measure the effects of such transfers on recipients' well-being. For instance, Fiszbein et al. (2009) have shown that CCT programs have led to important declines in poverty rates, Gertler (2004) and Barham (2011) show that they have improved nutrition and health, and Glewwe and Kassouf (2012) have studied the effects of CCT programs on education. In terms of unintended effects on labor market outcomes, research has also revealed, for example, that CCT programs seem to have little effect on paternal and maternal labor supply, and that this effect depends on the distribution of power in the household (Alzua, Cruces and Ripani, 2013). However, Garganta and Gasparini (2015) concluded that these programs may have an impact on transitions from formal towards informal employment, Gonzalez-Rozada and Llerena-Pinto (2011) showed that receiving a CCT prompts beneficiary mothers to experience longer periods of unemployment and Bergolo and Cruces (2016) found evidence that CCT programs have a negative impact on labor formality.

Many studies that analyze the effect of CCT programs on labor market outcomes use labor market participation and hours devoted to paid work in the market as the variables of interest, leaving aside many other activities dedicated to personal issues, family and social well-being. This comes as no surprise since there have been relatively few surveys that document the use of time in developing countries, and more

importantly there are several limitations in linking existing time-use surveys with other relevant socioeconomic data. It is now broadly recognized that unpaid work and leisure are important parts of the organization of the society and the economy, and, therefore, it is hard to understand the functioning of an economy or a society comprehensively without understanding the role of these important activities (Aguirre and Ferrari 2013; Hirway 2010). In the present study, I contribute to a better understanding of the mechanism of intra-household allocation of time by taking advantage of time-use data collected by the Living Standards Measurement Study survey in Ecuador. This data set allows me to measure the effect of the CCT program on the allocation of time to different activities

Many studies have analyzed the behavioral effects of CCT programs under the assumption that households act as a single rational unit in which the benefits of a social program are distributed in equal proportion among all family members. However, there is insufficient evidence of the effects of CCT programs on intra-household outcomes in an environment where the decision-making power of different members of the household changes, especially when the benefits of a social program are assigned to a specific adult within a household. In particular, it is not clear whether the improvement of a woman's utility outside of the marriage unambiguously enhances her relative position in the household (bargaining power), or how the enhancement of available monetary resources affects the incentives for time allocation of the spouses. This paper also contributes to the discussion of these two important issues.

There are several channels through which CCTs could affect women's decision-making power. In a Nash bargaining framework, an exogenous increase in women's resources leads to a higher reservation utility for exiting a partnership, which implies a higher relative bargaining power, granting the woman a more important role in decision-making. This framework implicitly assumes that a CCT given to the woman is kept under her control. The participation in a CCT program could also affect women's labor supply. For instance, a woman may increase or decrease her labor supply depending on the intra-household availability of resources. It is also possible that an increase in available household resources due to the CCT could lead to an increase in specialization within the household, implying more responsibility for women

in decision-making in certain spheres.

But, a CCT given to women does not always translate into a higher women's control over household resources. Some studies have found that providing transfers to women may not mean that women are allowed to have control over these resources by their partners (Handa et al., 2009). In addition, if a woman's access to resources depends on her partner before she becomes a beneficiary of the program, a CCT may only generate a crowding-out effect on these intra-household transfers, which implies that resources under the control of women will continue to be limited. Moreover, the conditionality associated with these types of programs could lead to a change in women's time allocation in order to fulfill the program requirements, and may negatively impact women's decisions to assign time to earn labor income, which may also cause a reduction in the amount of resources under women's control.

Several qualitative studies in the literature have found that CCT programs that assign cash to female beneficiaries raise women's intra-household decision-making power (Adato and Roopnaraine, 2010). However, quantitative studies of the effect of CCTs on female decision-making power are still inconclusive. Many quantitative studies have been conducted using data from Mexico. This literature provides a mixed picture in terms of the impact of CCT programs, such as "PROGRESA", on women's decision-making power. For example, Adato and Roopnaraine (2010) found no evidence of a direct effect of the Mexico's CCT on women's decision-making, while Attanasio and Lechene (2010) show that there is evidence of minor changes in the decision-making structure in certain intra-household decisions, from a structure unilaterally led by men to a joint decision-making process led by both men and women, and Handa et al. (2009) found no evidence of an effect of the CCT on women's decision-making power other than the ability to spend their own cash. In the same line, some papers have shown that the exogenous impact of CCTs on a household members' income leads to reactions in terms of household expenditure behavior due to changes to intra-household decision-making power (Angelucci 2008; Attanasio and Lechene 2010; Bobonis 2009; Djebbari 2005; Rubalcava, Teruel and Thomas 2009). Moreover, many comprehensive reviews of CCT programs exclude any quantitative studies of the impact of CCTs on intra-household decision-making (see, for instance,

Fiszbein et al. 2009; Holmes and Jones 2010; Molyneux and Tabbush 2008) and others, such as the review by Yoong (2012), reached no consensus on whether CCTs increase women's decision-making power.

The current literature provides some insights into the impacts that CCTs have on women's decision-making and time allocation; however, the evidence is limited, narrow in coverage, and lacking in insight into how impacts might differ in distinct contexts. In this paper, I contribute to the literature by studying how decision-making and the time allocation of spouses inside the household respond to cash transfers to women. To this end, I first implement an empirical analysis using a large-scale household living standards survey. I perform a two-stage strategy to study the effect of BDH on intra-household time allocation and decision-making power. First, I reconstruct the eligibility index to identify the potential beneficiaries of the program using a methodology from the Ministry of Social Inclusion of Ecuador that allows me to replicate the original eligibility index used by the governmental authorities to classify the beneficiaries of the program. Second, I use a fuzzy regression discontinuity design methodology to estimate the effect of the program on the outcomes of interest. My identification strategy relies on the fact that at the threshold of eligibility, the beneficiaries and non-beneficiaries are very similar.

In the following sections, I will present the most important features of the CCT program in Ecuador, the empirical strategy used and the estimation results. A succinct conclusion related to this chapter is provided at the end.

2.2 Cash Transfer Program in Ecuador

The cash transfer program in Ecuador was initially called *Bono Solidario*. It emerged in 1998 as a direct transfer to compensate the poorest households for the elimination of subsidies and did not require any specific behavior from the beneficiaries of the program. After five years, in 2003, the program was restructured in order to consolidate two previous programs in Ecuador: The *Bono Solidario* program and the *Beca Escolar* program (a monthly transfer of 5 USD per child for up to two children per household, conditional on those children's enrollment in school and a 90% attendance

rate). This new cash transfer program was called *Bono de Desarrollo Humano* (BDH) and had an open enrollment process that based the identification of beneficiaries by relying on local priests, who were considered to have reliable knowledge of poor people in their local communities. Then the program was changed and followed a human development approach, trying to implement the recommendations of international organizations. This was the the first program to use a proxy means test (PMT) to target the poorest families in Ecuador. The main objective of this new program was to improve the effectiveness of the targeting mechanism of this social policy, as well as contributing to human capital formation (Carrillo and Ponce Jarrin, 2009). The change in the structure of the program required beneficiary families to enroll their children between the ages of 5 to 18 in school and to maintain an attendance rate higher than 75%. Even though the co-responsibility of the program was imposed since the creation of the BDH, the enforcement of these requirements became partially effective only since 2007.

Starting in 2007, a process of reconfiguration of the BDH program began, within the framework of the constitutional and political transformations of Ecuador. The process of identifying the beneficiaries of the BDH has been modified over time, with important changes in 2009 and 2013. Each time the definition of the target population and the mechanism used to carry out the targeting have been modified. It is also worth mentioning that, in contrast to the Bono Solidario, which used a self-targeting mechanism, the BDH has always used a PMT to target potential beneficiaries.

The first phase of the BDH program started in 2003, targeting women with children aged 0-18 years using a compound index named *Sistema de Seleccion de Beneficiarios* (SELBEN). The main purpose of the introduction of the SELBEN index was to improve the identification of nuclear families in poverty conditions.[3] When the BDH program was launched in 2003, the monthly cash transfer for individuals with families in the bottom 20% (Quintile 1) of the SELBEN index distribution was fixed at 15 USD (12% of the minimum wage), and for individuals with families in the next 20% (Quintile 2) of the distribution was fixed at 11.50 USD (9% of the minimum wage).

[3]The SELBEN index, correctly predicts that 95% of households in the poorest quintile are eligible for the benefits and erroneously excludes 5% of them (Fiszbein et al., 2009).

Since the launch of the program, the targeting mechanism as well as the amount of the cash transfer has been modified over time. In 2007, the transfer was significantly raised to 30 USD (18% of the minimum wage) for individuals with families in the bottom 40% (Quintile 1 and 2) of the SELBEN index distribution, i.e. women with children aged less than 18 years old scoring less than 50.65 points of the SELBEN index.

The second phase, initiated in 2009, tracked and monitored potential beneficiaries through a process of registering families located in areas with high poverty levels, as measured by the 2001 Census. In this new phase, the governmental authorities updated the targeting mechanism with the implementation of a new database called *Registro Social* (RS) and the construction of a new index that was called *Indice de Bienestar* (denoted RS index). This targeting structure was used from August 2009 until March 2013. This new targeting mechanism also implied another increase in the payment, with the cash transfer fixed to 35 USD (16% of the minimum wage) for individuals with families with a score less or equal than 36.5 points in RS index (Buser, 2015). However, another change in the eligibility rule happened on March 2013, when the beneficiaries whose score was between 32.5 and 36.5 points were excluded from the program.[4]

The third phase started in 2013 with new update in the database of the registry and the construction of a new index which was renamed as *Registro Social II* (RSII). Under this new structure, the cash transfer was fixed at 50 USD (16% of the minimum wage) for individuals within families that score less or equal than 28.2 points in the RSII index, which is defined to be a vulnerability protection band. Over time, the program's main objectives have remained similar through the different phases of becoming an important tool to fight poverty. A detailed map at the province level, showing the association between the unsatisfied basic needs poverty rates, consumption poverty rate and program beneficiaries are displayed in Figure (B.1). Provinces with higher rates of poverty are also the ones with higher presence of the program participants, which suggest a reasonable good implementation of the program.

[4]According to the ministerial agreement No. 197 of the 28 March 2013, governmental authorities decided to change the cutoff point for potential beneficiaries to 32.5.

2.3 Data

2.3.1 Data Description

This study uses the Ecuadorian *Encuesta de Condiciones de Vida,* which I will refer to as the Living Standards Measurement Study (LSMS) survey database, which is collected by the National Institute of Statistics and Census (INEC). I will use the 2013-2014 round of the LSMS survey. The LSMS suvey is a household survey that collects information on income and expenditure, household production, housing, health, assets, public services access, education, time use, and other information. Ecuador's four regions, 24 provinces, nine planning zones and four main cities are all represented in the survey. The overall sample includes 28,970 households and 109,694 individuals. From this survey it is possible to identify the recipients of the Ecuadorian conditional cash transfer program. More specifically, information about the receipt of BDH transfers is collected in section seven of the household questionnaire under "Transfers and Monetary Assistance". The type of transfer, the frequency, the amount, and the co-responsibilities of the program, among other topics, are also asked in this section.

In terms of the BDH characteristics, in 2013-2014, around 1.12 million households (25.8% of total households) receive the CCT; this represents around 4.73 million individuals (29.7% of the total population) who benefit from the program. Disaggregating by type of recipient, around 0.67 million households (15.5% of total households) receive the CCT that is targeted to mothers; this represents around 3.37 million individuals (21.1% of the total population) who benefit from this branch of the program. The reported numbers of BDH beneficiaries' coverage reported by the Coordinating Ministry of Social Development (MCDS) are very similar to the numbers obtained from the LSMS. For replication of the targeting index, this study uses all the individuals in the LSMS in order to reproduce the living conditions of the Ecuadorian population. However, for the econometric analysis it is necessary to limit the sample. First, I drop from the sample households that declared that they received BDH benefits for elderly and disabled. That is, only the households that report being non-beneficiaries or mother-type beneficiaries are retained in the sample. Then, I selected

only the households that were interviewed in April 2014 or later, as this is when the application of the RSII index began. Lastly, I select households in which a woman head or spouse is living or cohabitating with a male head or spouse. The final sample is composed of 9,985 households.

2.3.2 Definition of Variables

Bargaining Power Variables

Using the "Social Capital" section of the LSMS questionnaire, I selected a set of questions that provide information on the intra-household decision-making process. These questions were asked separately of the household head and of the spouse, and they cover several distinct decision domains. Specifically, the survey questions request information on which person in the household decides: "whether to work or not"; "how many hours to work"; "where to work"; "on what to work"; "who stays at home doing household chores"; "until what educational level the children study"; "what to do if a child gets sick"; "expenses for children"; "personal expenses"; "how to use the income from your work"; "large purchases (cars, housing)"; "how you dress" and "what to do with your free time". Response options in the survey included: "myself"; "my spouse or partner"; "decisions are made jointly" and "decisions are made by others". Using this questionnaire provides the advantage of identifying the effect of the CCT program in many important areas of intra-household decision-making. Since there are a variety of decision domain outcomes, using each individual outcome separately could lead to spurious statistical significance of impacts due to random chance. Therefore, I construct two different types of indices of decision making that condense the underlying information of each of these domains. First, I generate an index through a categorical principal component analysis procedure.[5] This procedure is useful because it implements an optimal scaling procedure that allows the choice

[5]In relation to the common principal component analysis, this method does not rely on the assumptions of linear relationships between numerical variables, nor on the multivariate normality of the data.

of both measurement level and a number of sets.[6]

This specification leads to an index that ranges from 0 to 10. I also construct a simpler composite index. To do this, I first create a binary indicator for each decision-making domain in which the indicator equals 1 if the woman respondent reports making the decisions "myself" or "decisions are made jointly" and 0 otherwise. Then, I assign 1 point for each time the woman indicates having sole or joint decision-making power across all applicable domains. These composite index ranges from 0 to 13.

Time Use Variables

The time use module of the LSMS household questionnaire collects information on a range of activities, including time spent in labor market activities, household chores, childcare, elderly care, grocery purchases, free time activities, sports, sleep and community work activities. From this set of variables, it is possible to identify the number of hours that each member of the household older than 12 years has devoted to different activities such as housework, paid work, community activities and leisure. As is common in many time use surveys, the declared time allocated to the different activities, with the exception of paid work, are estimates and approximations of the informant. Therefore, the sum of time for the different activities in a week does not necessarily equal to 168 hours. I use this information with the sample of 9,985 households previously defined in order to construct the complete database for the empirical analysis.

2.3.3 Descriptive Statistics

Table (2.2) presents selected descriptive statistics of household characteristics, and Table (2.3) shows descriptive statistics of time allocation and bargaining power variables. All the numbers are based on the sample used for the analysis, as they are shown separately for the beneficiary and non-beneficiary households. It is important to note that if I refer to woman it can be a female household head or spouse

[6]This allows one to take into consideration that variables can be categorical, nominal, or ordinal and also allows to specify how many groups of variables are to be compared with other groups of variables.

and similarly if I refer to man it can be a male household head or spouse. All the households in the analysis are composed by a couple. Table (2.2) shows that women and men in beneficiary households are younger, less educated and have more children than women and men in non-beneficiary households. Additionally, beneficiary men and women have lower income, tend to live in a poorer district and have a lower number of disabled adults living in the household compared to non-beneficiary men and women.

Table (2.3), reveals important differences in the allocation of time to different activities by beneficiary status. Compared to women non-beneficiaries, women beneficiaries allocate more hours to paid work (around 0.4 more hours), housework activities (around 5.0 more hours) and community activities (around 0.5 more hours), and fewer hours to leisure activities (around 5 less hours). Regarding men beneficiaries, they reported that they allocate more hours to paid work activities (around 0.7 more hours), housework activities (around 0.7 more hours) and community activities (around 0.6 more hours), and less hours to leisure activities (around 4.4 less hours), as compared to non-beneficiary men. For both, women and men, the differences in hours allocated to housework, leisure and community activities among beneficiaries and non-beneficiaries are statistically significant.

Table (2.4), reports differences in women's decision making power in several domains, as well as differences in the overall bargaining power indices among beneficiary and non-beneficiary households. Women in beneficiary households tend to have higher bargaining power in domains related household chores and child care relative to women in non-beneficiary households. For the bargaining index constructed using a categorical principal component analysis (Women's Bargaining Power I in Table (2.4)), the overall index shows that women in beneficiary households tend to have higher bargaining power relative to non-beneficiary women. Using the same metric of bargaining power, women in beneficiary households have a higher women's bargaining index in decision domains related to work activities, home and personal activities and purchases. A similar situation is observed when I use the composite bargaining index (Women's Bargaining Power II in Table (2.4)), with the exception that index related to work activities, which shows no difference among beneficiary and non-beneficiary

households.

These differences observed in the descriptive statistics tables are consistent with the targeting strategy of the program and suggest that a simple comparison of the variable of interest, such as the hours allocated to the different activities as well as the women's bargaining power related to different decisions, among beneficiary and non-beneficiary households is unlikely to yield credible program estimates. Therefore, it is necessary to control for differences in observable and unobservable characteristics between program beneficiaries and non-beneficiaries—as with the fuzzy regression discontinuity approach—in order to obtain credible program estimates.

2.4 Empirical Strategy

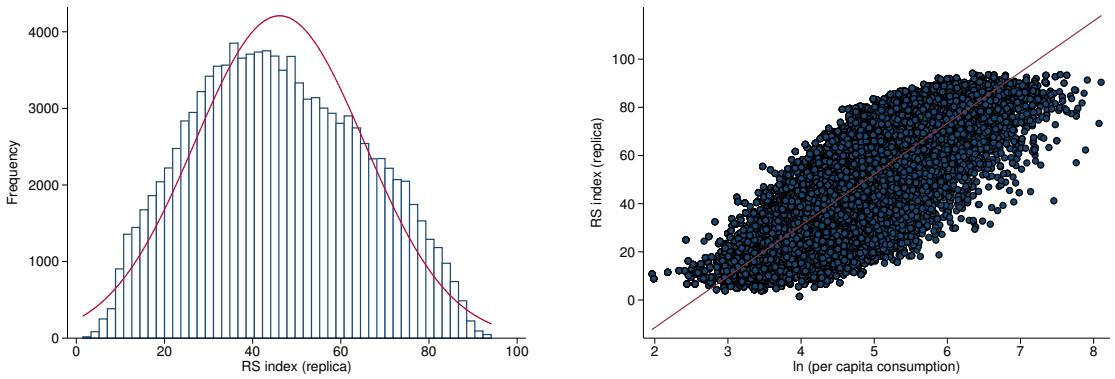
2.4.1 Eligibility Index Replica

An important issue for the empirical identification strategy is the reconstruction of the targeting mechanism of the BDH. To implement the regression discontinuity design, I need to have information on the RSII index which is essential for determining the program eligibility. The available database has information on the outcomes of interest, characteristics of household members as well as information about the participation in the program. However, in the data set I do not observe the household score on the RSII index. Therefore, in order to replicate the assignment, process the first step is to replicate the RSII index using the LSMS data set. The eligibility criteria index is constructed using a restricted methodology and database from the Coordinating Ministry of Social Development (MCDS) called *Registro Social*. With this database, the Technical Secretariat Unit of the MCDS generates an index. This type of index is a proxy means test index which is expected to be related to the consumption poverty, but with a multidimensional perspective based on Bourguignon and Chakravarty (2003). The RSII is a 0 to 100 index and is constructed using Nonlinear Principal Component Analysis (NLPCA) with the combination of 34 variables. These variables can be classified into the following groups: asset possession (12 variables), dwelling and household characteristics (15 variables) and individual characteristics (7

variables).

Figure 2.1: Replication of the Eligibility Index (RSII index) using the the ECV Survey

(a) Index Distribution (full sample) (b) Correlation RS Index and Consumption



Notes: In the left panel I show the distribution of the replicated index (eligibility tool) for the entire sample. In the right panel, I show the correlation between the RS index and per capita consumption, which is approximately 0.60. The original index has a correlation of 0.62. The obtained index is very close to original instrument used by government to classify beneficiaries.

This set of variables allows one to classify households according to their eligibility status on the basis of a cutoff (Fabara, 2009). As described in the previous section, families that score 28.2 points or lower on the RSII index were eligible to receive the benefits of the program, while families scoring above this threshold were disqualified. While the RSII index is constructed using 34 variables, the available database contain information on 33 of the 34 variables.

To replicate the index, I use the available information in the LSMS data. Since I have the restricted methodology used by the Ministry to construct the index, I will follow the same statistical procedure[7] to construct my replication of the original index. I calculate the weights for the restricted set of 33 variables and create a quasi-RSII index. Figure (2.1) shows a histogram of the frequency of households by the created index. The distribution of RSII index is close to a normal distribution. The 2-dimension specification accounted for 37.6% (the original accumulated 33.7%) of

[7]With the available input from the LSMS, I run the CATPCA algorithm attempting to replicate the index as close to the original.

the total variance, and had a 60% correlation with the monthly per capita aggregate consumption (formerly 62.4%). The cutoff choice was originally obtained by selecting values of the index that represented households with extreme consumption poverty. For the RSII index, the eligibility criterion was calculated by estimating an OLS model of the RSII index and the logarithm of the aggregate per capita consumption. The critical value was obtained by mapping the extreme poverty line, plus a vulnerability protection band, into the index units using the estimated OLS equation. The official threshold obtained by the Technical Secretariat Unit of the MCDS was 28.2. I followed the same procedure and obtained a critical cutoff value of 34.04. The scatter plot of the regression of RSII index and the logarithm of the aggregate per capita consumption can be seen in Figure (2.1).

2.4.2 Regression Discontinuity

As discussed above, while there is ample evidence on the effect of CCT programs such as the BDH on intended outcomes, the influence of these types of programs on unintended outcomes such as the adult time allocation and adult intra-household decision-making is still unclear. The goal of this study is to exploit the discontinuity in the program assignment mechanism, to identify the local causal effect of receiving the BDH on the outcomes of interest. To isolate the effect of the program, I begin with the following model:

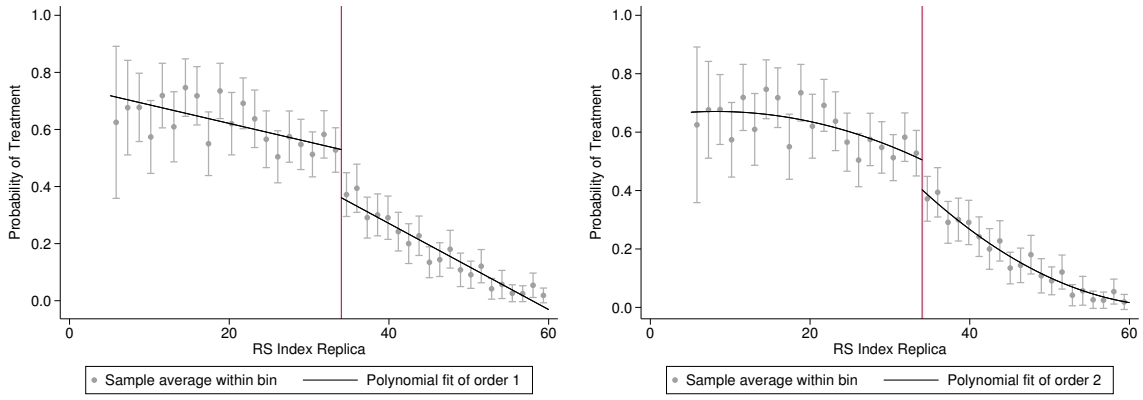
$$Y_i = \alpha T_i + f(R_i) + \mathbf{X}_i'\beta + \varepsilon_i \tag{2.1}$$

where Y_i is the outcome variable, e.g. time use or decision-making variables, T_i is a treatment indicator that takes the value of $T_i = 1$ if an individual lives in a household that receives the BDH (treated), and 0 otherwise (untreated), R_i is the running or forcing variable, which in this case is the household RSII index score, $f(R_i)$ is a flexible function (polynomial) of the RSII index[8], X_i is a vector of individual and

[8]The $f(R_i)$ polynomial function of the RSII index score R_i represents the relationship between the running variable and the outcome. A variety of functional forms can be tested to determine which fits the data best, so that bias will be minimized. In the parametric analysis of the RD design, it is typically used linear and quadratic specifications. For each of the n polynomial terms of $f(R_i)$,

household characteristics and ε_i is an error term. Given that program participation is not random nut rather focuses on the poor, T_i can be correlated with the error term ε_i. Therefore, if I estimate Equation (2.1) through OLS, the estimate of α is probably biased. To overcome this problem, I take advantage of the program targeting mechanism and rely on a regression discontinuity (RD) strategy to isolate the causal effect of the program (Thistlethwaite and Campbell, 1960; Imbens and Lemieux, 2008). The participation on the program depends on the RSII index score that a household obtains. The program tries to target only families with a score below 28.2 (in our case 34.04).[9] This mechanism generates a relationship between treatment status and the RSII index.

Figure 2.2: Discontinuity in Probability of Treatment at Cutoff 34.04



Notes: the plot shows the existence of a discontinuity in the probability of treatment. In the left panel there is a decrease of approximately 10% in the probability treatment, at the discontinuity cutoff 34.04, given a linear polynomial. In the left panel, we observe that there is also a decrease of approximately 9% in the probability treatment, at the discontinuity cutoff 34.04, given a quadratic polynomial.

Figure (2.2) illustrates the negative relation between the RSII index and the probability of being treated. These plots are constructed using data-driven choices of the

there is a coefficient that go with each of terms. It is important to note that a regression discontinuity design assumes that the relationship between the outcome variable and the variable that determines treatment is known. Wrongly specifying the functional form can bias the estimates because of model misspecification. Therefore, it is important to implement several specification checks.

[9]This design implies that assignment to the program depends on the value of an observed continuous variable (RSII index) relative to a given cutoff point.

number of the evenly spaced bins (see Calonico, Cattaneo and Titiunik, 2015). In general as the RSII index rises the probability of getting the treatment decreases. Moreover, there is an important decline at the cutoff point of 34.04. Households with a RSII index of slightly less than 34.04 are about 10 percentage points more likely to be in the treatment group relative to households that have a RSII index slightly above this cutoff.

As illustrated in Figure (2.2), the relationship between the RSII index and the probability of getting treated provides exogenous variation in treatment status which may be used to identify the causal effect of the program. Figure (B.2) complements Figure (2.2) with an additional plot showing the discontinuity in the probability of treatment using a locally weighted regression. This plots exhibit a similar pattern as Figure (2.2), and reveal the existence of a discontinuity in the probability of treatment of 10 percent.

Households were not assigned to the program based on the RSII index.[10] As can be observed in Table (B.1), there is a fair degree of fuzziness in program assignment. For roughly 80 percent of the sample, eligibility and program status match, but there are around 11 percent who are eligible but do not receive the program and around 7 percent who are not eligible but do receive the program.[11]

Thus, assignment to treatment status depends on the RSII index in a probabilistic manner. Given the fuzzy regression discontinuity, instead of a deterministic assignment rule, there is a change in the probability of treatment at the cutoff point given by:

[10] That is, the data do not show that all the households below the cutoff point $c = 34.04$ receive the treatment ($R_i \leq c \Rightarrow T_i = 1$) and that all the households above $c = 34.04$ do not receive the treatment ($R_i > c \Rightarrow T_i = 1$). Therefore, T is not a deterministic function of the RSII index score.

[11] A possible explanation for this non strict compliance is that after the restructuring of the program that the Ecuadorian government began in January 2013, eligible households who were unable to report its living conditions at the time the government was collecting information for the calculation of the RSII index, although eligible, do not receive the BDH. On the other hand, the restructuring process was probably not perfect and some households that used to receive the program under earlier structures continue to receive the benefits through the new BDH program design, even though the new RSII index score shows that these household were not eligible anymore. A more likely technical explanation is that there is reandom measurement error in the LSMS dta and maybe in the BDH data also.

$$P\left(T_i = 1 \mid R_i\right) = \begin{cases} f_1\left(R_i\right) & if \quad R_i \leq c \\ f_0\left(R_i\right) & if \quad R_i > c \end{cases} \tag{2.2}$$

with $f_1(c) \neq f_0(c)$ and $c = 34.04$. Equation (2.2) formalizes what was observed in Figure (2.2) and can be interpreted as the discontinuity in the probability of getting the treatment at the threshold. Given that I have information on the RS index (running variable), the exogenous threshold of program assignment (34.04 points), the treatment indicator of receiving the BDH and information on the outcomes of interest, the fuzzy regression discontinuity (RD) design allows me to isolate a local average treatment effect (LATE) of the BDH, by associating a jump in the mean outcome with a jump in the probability of treatment, when the running variable crosses the threshold (Thistlethwaite and Campbell, 1960; Imbens and Lemieux, 2008). I can create a binary instrumental variable defined as:

$$Z = 1\left\{R_i \leq 34.04\right\} \tag{2.3}$$

Then, using the stochastic relationship between the RSII index and the probability of the treatment, and following Imbens and Lemieux (2008) and Hahn, Todd and der Klaauw (2001), the fuzzy regression discontinuity estimate can be obtained as a non-parametric ratio of the difference in the mean response at the cutoff to the difference in the probability of treatment at the cutoff[12]:

$$\alpha_{FRD} = \frac{\lim_{r \downarrow c} E\left[Y_i \mid R_i = r\right] - \lim_{r \uparrow c} E\left[Y_i \mid R_i = r\right]}{\lim_{r \downarrow c} E\left[T_i \mid R_i = r\right] - \lim_{r \uparrow c} E\left[T_i \mid R_i = r\right]} \tag{2.4}$$

Equation (2.4) represents the LATE.[13] Following Angrist and Pischke (2009) and Hahn, Todd and der Klaauw (2001), a fuzzy RD can be implemented using an instrumental variable approach. Program participation, or the first stage equation, is treated as a function of an instrument (Z), the RSII index (R) and the vector of individual and household characteristics (X). This first stage equation can be expressed

[12]This expression can also be expressed as: $\alpha_{FRD} = \frac{E[Y_i|Z=1]-E[Y_i|Z=0]}{E[T_i|Z=1]-E[T_i|Z=0]}$

[13]The estimate of α_{FRD} is local not only if is estimated for the compliers but also because it applies only to those around a specific vicinity (see Angrist and Pischke 2009).

as:

$$T_i = \gamma Z_i + f(R_i) + \mathbf{X}_i'\delta + \mu_i \tag{2.5}$$

As seen in Figure (2.2), the assignment rule is correlated with the probability of treatment, consequently as the instrument Z is based on the assignment rule it is likely to be highly correlated with program participation. Additionally, it is necessary to assume that any unobserved characteristics that determine individuals time use or decision-making are not correlated with the instrument, i.e., we assume $E[Z_i\varepsilon_i \mid X_i, R_i] = 0$. If this assumption holds, then consistent estimates of the impact of the CCT program can be obtained by estimating:

$$Y_i = \alpha\hat{T}_i + f(R_i) + \mathbf{X}_i'\beta + \varepsilon_i \tag{2.6}$$

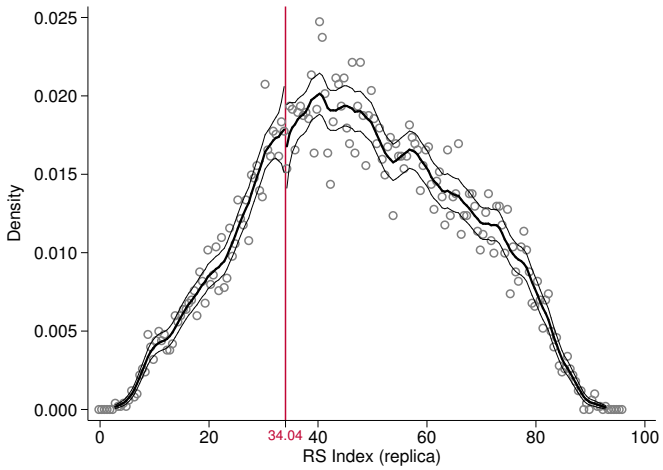
where $\hat{T}$ is obtained from Equation (2.5). I will estimate several specifications of Equation (2.6).[14]

As with many social programs, the CCT program in Ecuador is subject to the possibility of manipulation of the beneficiary selection rules. An important condition for identification in the regression discontinuity design is the continuity of the conditional expectation of the counterfactual outcomes in the running variable. This continuity assumption may not be credible if individuals are able to influence the rule that determines assignment to treatment, specifically their position in the RSII index relative to the cutoff. In the present study, this should not be a problem as families do not have any control over the calculation of the RSII index or information about the scoring procedure. Moreover, the survey data that I use in this study were not used to select beneficiary families, so there is not an incentive for the household members to misreport this information in the survey. It is important to mention that the test has a limitation in the context of this study, since the running variable is a replication of the original index that the Ministry of Social Inclusion of Ecuador uses to select beneficiaries. However, it is important to document that there is no jump

[14]Specifically, I will run linear and quadratic specifications to check the robustness of the results and I will also show results at different bandwidths to check for the stability of the parameter related to the impact of the CCT.

in the density at the threshold in order to provide evidence of the appropriateness of the regression discontinuity design. Therefore, one should formally test that there is no manipulation in the running variable, so I perform a test of the presence of manipulation related to the running variable proposed by McCrary (2008).

Figure 2.3: McCrary Manipulation Test for the Eligibility Index



Notes: The plot is a finely-gridded smoothed histogram showing that there is no apparent difference in density around the 34.04 threshold. Specifically, the McCray manipulation test is t=-0.627 with a p-value of 0.531. Therefore, there is no statistical or visual evidence of systematic manipulation of the running variable (RS Index). The plot is constructed with a binsize of 0.5 and a bandwidth of 3.

Figure (2.3) shows that there is no significant discontinuity around the cutoff 34.04 in the local density function of the households according to their RSII eligibility index. This is also formally confirmed in Table (2.1) in which I perform a regression discontinuity manipulation test using local polynomial density estimation and found that it is not possible to reject the null hypothesis of no statistically significant discontinuity in the density around the threshold.

Table 2.1: RD Manipulation Test Using Local Polynomial Density Estimation

Method	T	P>T
Conventional	-0.436	0.663
Robust	-0.504	0.614
N	9,985	
Effective N	2,460	

Notes: The table shows the results of the implementation of the manipulation testing procedure using the local polynomial density estimators proposed in Cattaneo, Jansson and Ma (2018). For a review on manipulation testing see McCrary (2008). With a robust bias-corrected local polynomial of order 2 density estimator I obtain a T=-0.504 and an associated p-value of 0.614<0,10, it is not possible to reject the null hypothesis of no statistically significant differences of the densities around the threshold. *significant at 10%; **significant at 5%; ***significant at 1%.

Finally, one of the challenges of implementing an RD design is the choice of the bandwidth. There is an important trade-off between smaller bandwidth (less bias but higher variance) and a larger bandwidth (more bias but less variance). Recent developments in the empirical literature have provided a data-driven local polynomial RD methodology (Calonico, Cattaneo and Titiunik, 2014*a*,*b*; Calonico, Cattaneo and Farrell, 2018). This approach offers an array of data-driven nonparametric inference procedures to obtain point estimators and bias-corrected confidence intervals. This study will use these complementary estimation tools.

2.5 Estimation Results

2.5.1 Intra-household Time Allocation

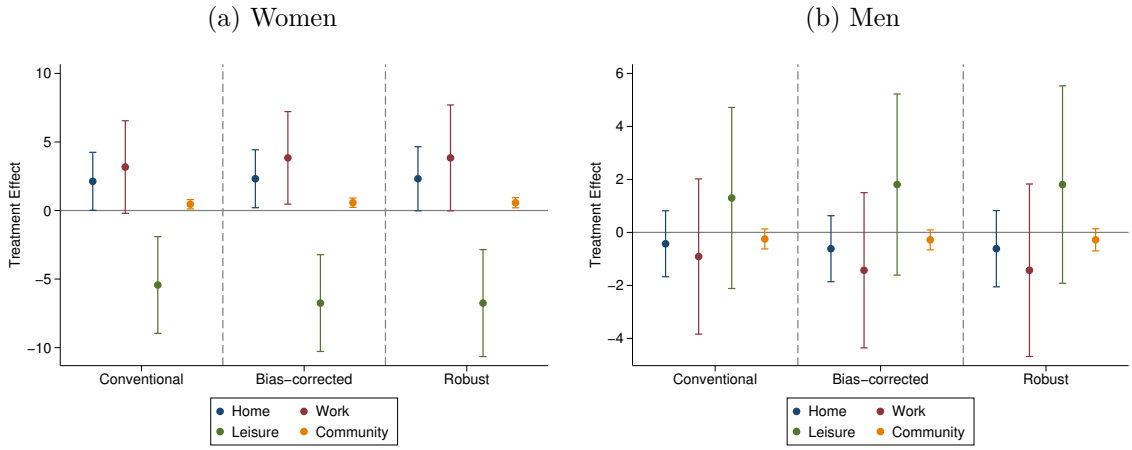
Instrumental variable estimates of the effect of BDH program on time use for men and women are provided in Table (2.5). In all the models, I find that living in a household with a RSII index score below 34.04 increases the probability of receiving the CCT program by 10.2 to 10.8 percent. In relation to the relevance of

the instrument, in these 1st-stage regressions the F-statistics for the null hypothesis that the instrument does not induces significant variation, are between 12 and 13 (all with an associated p-value lower than 0.05). These F-statistics are around the benchmark 13 for non-weak instruments (Stock, Yogo and Wright, 2002). The IV estimates (second stage) indicate that the BDH program influences the allocation of time of women, whereas for men the estimated effects of the program are generally smaller and statistically insignificant. Receiving the CCT increases women's time allocated to housework (by 2.0 hours per day), paid work (by 3.3 hours per day) and community activities (by 0.4 hours per day).

Table (2.6), provides non-parametric estimates using the methodology developed by Calonico, Cattaneo and Titiunik (2014*a*), Calonico, Cattaneo and Titiunik (2014*b*) and Calonico, Cattaneo and Farrell (2018). This approach is useful because it provides data-driven bandwidths calculated separately for each specification. Table (2.6) compares the conventional estimates employing the conventional variance estimators with the conventional but bias-corrected and bias-corrected robust non-parametric estimators. Given that each specification has a particular bandwidth, the sample size (effective number of observations) varies for each model. The estimated effects are summarized in Figure (2.4). Consistent with the result of the IV estimation, the plot for women shows a positive effect of the CCT on the time devoted to housework, to paid work and to community activities. On the other hand, the plot for men shows that the BDH program reduces the number of hours allocated to the different activities, however the estimated effect is not statistically significant. As shown in Table (2.6), on average, women on BDH beneficiary households assign about two more hours to housework activities, three more hours to paid work activities and half of an hour more to community activities relative to women in non-beneficiary households. While there is no statistically significant effect of the cash transfer on men's time allocation, estimates in Table (2.6), suggest that men in beneficiary households spent about 0.4 hours less in housework activities, 0.8 hours less in paid work activities and 0.2 hours less in community activities relative to men in non-beneficiary households. It is important to mention that, consistent with Figure (2.2), across the different specifications there is a clear effect of eligibility on program participation. In all the

regressions, program eligibility is associated with a nine to eleven percentage point increase in the probability of receiving the program.

Figure 2.4: Estimated Effects of the BDH Program on Intra-household Time Allocation



Notes: The figure shows the estimated effects of the cash transfer program on time allocation to housework, paid work, leisure and community activities. The sample includes two-parent households with individuals older then 18 years of age and children under 18 years old. The treatment effects are measured in hours per day and each come from a fuzzy regression discontinuity. Including covariates are: head and spouse education and race, number of kids below 5 years old, poverty rate at sector level, average household income, number of disabled adults in the household and average home hours of all the household members except the woman or man head or spouse.

In Table (B.2), I perform a robustness check employing a quadratic specification for each of the regressions related to women's time allocation. Using the quadratic specification, women's time devoted to housework and community activities remained statically significant at the 10 percent level, but women's time to paid work is no longer significant. In terms of the magnitude of the effects under the quadratic specification, receiving the BDH program raises the time spent in housework by 2.8 hour per day and time spent in community activities by 0.6 hours per day. The magnitude of these effects are close to the ones obtained under the linear specification. Finally, in Figure (B.3) I check how sensitive these estimates are to bandwidth choice. Consistent with the results in Tables (2.5), (2.6) and (B.2), Figure (B.3) shows that the point estimates

of the regression discontinuity LATE at varying bandwidths are stable.

2.5.2 Bargaining Power

Bargaining power indices have been standardized since the constructed indices do not have a natural scale, therefore the effects of the program can be interpreted as standard deviation effects. Table (2.7) reports the instrumental variable estimates for the overall women's bargaining power index as constructed using categorical principal component analysis as well as for each of the three specific decision-making domains. Results indicate a positive impact of the BDH program on women's decision-making power. On average, women in beneficiary households experience a 1.9 standard deviation increase in the overall index, a 2.1 standard deviation increase in the index related to home and personal decisions, and 1.2 standard deviation increase in the index for purchase decisions. These results represent increases of 30, 42 and 22 percentage points over baseline mean values, respectively. Turning to the robust non-parametric estimates, in Figure (2.5) shows positive and significant program impacts in two of the four indices.

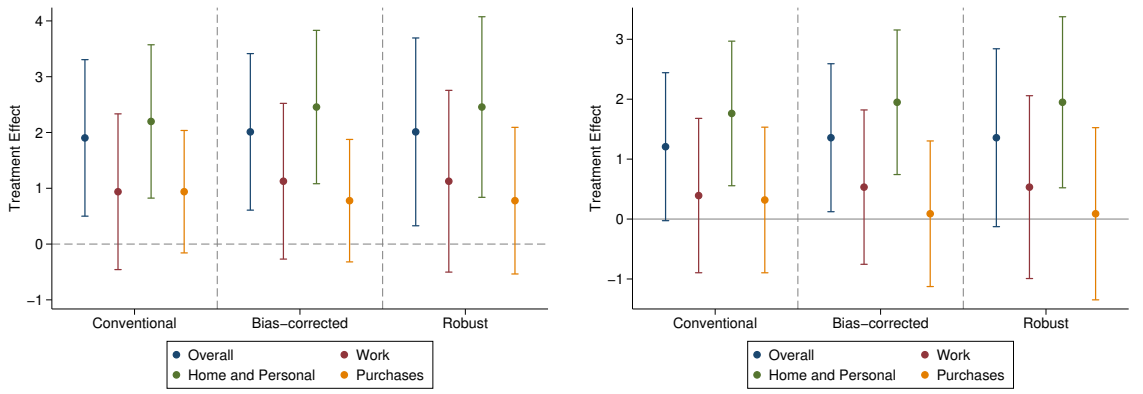
Table (2.8) demonstrates that receiving the BDH program increases the women's overall decision-making index by 2.0 standard deviations and also the index related to decisions in home and personal activities rises by 2.5 standard deviations. Both effects are robust to a change in the polynomial degree of the specification. Specifically, using a quadratic specification, the effect of the BDH program on the overall index is 1.7 standard deviations, whereas in the case of the home and personal decisions index the effect is 2.6 standard deviations. On other hand, even though the CCT program positively influences the indices related to work and purchase decisions, these coefficients are not statistically significant. Regarding the sensitivity of these estimates, Figure (B.4) confirms the stability of estimated effects to bandwidth choice.

I also created another measure of bargaining power using a composite index that ranges from 0 to 13. The results of the effect of the CCT program on these indices are presented in Table (B.3). As expected, the composite measure also shows a positive impact of BDH program on the number of decisions domains a woman is involved in,

by a magnitude of 1.2 standard deviations, representing an increase of 27 percentage points over baseline mean values. Similarly, the CCT program has a positive effect of 1.7 standard deviations on home and personal decisions index, representing a 44 percentage points rise over baseline mean values. These two effects are statistically significant at conventional levels.

Figure 2.5: Estimated Effects of the Impact of the BDH Program on Women's Decision-Making

(a) Women's Decision Making (NLPCA Index) (b) Women's Decision Making (Composite Index)



Notes: The figure shows the estimated effects of the cash transfer program on time allocation to housework, paid work, leisure and community activities. The sample includes two-parent households with individuals older then 18 years of age and children under 18 years old. The treatment effects are measured in hours per day and each come from a fuzzy regression discontinuity. Included covariates are: head and spouse education and race, number of children below 5 years old, poverty rate at sector level, average household income, number of disabled adults in the household, and average home hours of all the household members other than the woman or man head or spouse.

Turning to the robust inference, the estimated effects using the non-parametric approach are synthesized in Figure (2.5). Consistent with the result of the IV estimation, the plot shows that the program has an effect on the estimated effect on the overall index and on the home and personal decisions index, although the overall index is only weakly significant.

Table (B.4) demonstrates that receiving the BDH program increases the overall

women's decision-making index by 1.3 standard deviations and also raises by 1.95 standard deviations the index related to decisions in home and personal activities. In Table (B.4), I also perform a robustness check employing a quadratic specification for each of the regressions for the different domains of decision-making power. Using the quadratic specification, only the index related to home and personal decisions remain statically significant at the 5 percent level. Finally, consistent with the results obtained before, Figure (B.5) shows that the point estimates of the regression discontinuity LATE at varying bandwidths are stable.

2.6 Conclusion

In this paper, I have studied how intra-household time allocation and bargaining power respond to conditional cash transfers. Exploiting the program structure and the targeting mechanism, I used a fuzzy regression discontinuity design to estimate the impacts that the CCT program in Ecuador has an impact on female time allocation and on female's bargaining power. In particular, I estimated the impact of the program on women's and men's hours devoted to paid work, housework, community activities and leisure. Following the same structure, I studied whether resource transfers to women through the BDH program influence women's positions within the household, as measured by an index of decision in domains related to work activities, home and personal activities and purchases. Overall, I found that cash transfers affect the allocation of time of women, do not have an effect on the time allocation of men and also influences women's say in certain dimensions of intra-household decisions. This study contributes to building evidence on the different unintended consequences that cash transfer programs create, which could carry important implications for future design of poverty policies.

Table 2.2: Descriptive Statistics of Household Characteristics

	Total Sample (N=9,985)		Beneficiaries[a] (N=2,138)		Non-beneficiaries[b] (N=7,847)		Difference (N=9,985)
	Mean	SD	Mean	SD	Mean	SD	$a - b$
Household Characteristics							
Woman's Age	41.16	14.71	36.87	9.71	42.33	15.60	-5.46***
Man's Age	44.81	15.08	40.42	10.68	46.01	15.86	-5.59***
Woman's Years of Education	8.94	4.75	6.54	3.26	9.60	4.88	-3.06***
Man's Years of Education	9.11	4.64	6.93	3.30	9.70	4.78	-2.77***
Number of Children <5	0.53	0.75	0.81	0.89	0.46	0.69	0.36***
Number of Children	1.69	1.50	2.98	1.56	1.34	1.27	1.64***
Mean NBI Poverty at District	2.17	1.39	1.27	0.68	2.42	1.44	-1.15***
Household Average Income	245.26	335.66	106.31	85.94	283.12	366.97	-176.81***
Woman's Income	190.00	420.47	86.14	164.46	218.29	462.45	-132.15***
Man's Income	613.41	858.95	365.59	274.20	680.93	947.14	-315.34***
Number of Adults with Disability	0.11	0.35	0.07	0.26	0.12	0.37	-0.05***

Notes: The table shows a set of important characteristics of the households used for the analysis. A woman is a female head of household or spouse and similarly a men is a male head of household or spouse. *significant to 10%; **significant to 5%; ***significant to 1%.

Table 2.3: Descriptive Statistics of Time Allocation Variables

	Beneficiaries[a] (N=2,138)		Non-beneficiaries[b] (N=7,847)		Difference (N=9,985)
	Mean	SD	Mean	SD	$a - b$
Women's Time Allocation					
Paid Work Hours	21.09	18.55	20.73	20.80	0.37
Housework Hours	35.69	12.88	30.66	13.60	5.03***
Leisure Hours	76.95	11.73	81.91	14.81	-4.96***
Community Hours	0.70	2.29	0.19	1.18	0.51***
Men's Time Allocation					
Paid Work Hours	43.37	15.72	42.72	19.61	0.65
Housework Hours	7.35	7.23	6.66	7.10	0.69***
Leisure Hours	77.15	11.66	81.57	14.82	-4.42***
Community Hours	0.86	2.58	0.30	1.64	0.55***

Notes: The table shows the set of variables that are used as dependent variables in the analysis. A woman is a female head of household or spouse and similarly a men is a male head of household or spouse. *significant at 10%; **significant at 5%; ***significant at 1%.

Table 2.4: Descriptive Statistics of Bargaining Power Variables

	Beneficiaries[a] (N=2,138)		Non-beneficiaries[b] (N=7,847)		Difference (N=9,985)
	Mean	SD	Mean	SD	$a-b$
Women's Decision					
Whether to Work or Not	0.83	0.38	0.83	0.38	0.00
How Many Hours to Work	0.82	0.39	0.79	0.41	0.03**
Where to Work	0.82	0.38	0.81	0.39	0.01
On What to Work	0.83	0.37	0.81	0.39	0.02*
Who Does Household Chores	0.90	0.30	0.68	0.47	0.23***
Education of Children Study	0.93	0.25	0.68	0.47	0.25***
What to Do if Child Gets Sick	0.96	0.20	0.70	0.46	0.26***
Expenses for Children	0.91	0.29	0.67	0.47	0.24***
Personal Expenses	0.91	0.28	0.91	0.28	0.00
Use of Work Income	0.70	0.46	0.71	0.46	-0.01
On Large Purchases	0.88	0.32	0.90	0.30	-0.02*
How you Dress	0.97	0.18	0.97	0.16	-0.01
About Using Free Time	0.97	0.18	0.97	0.18	-0.00
Women's Barg. Power I					
Overall	9.56	0.94	8.57	1.81	0.98***
Work Activities	9.07	1.95	8.70	2.64	0.37***
Home and Persona Activities	9.88	0.74	8.35	2.55	1.53***
Purchases Bargaining	9.14	1.30	8.38	1.92	0.76***
Women's Barg. Power II					
Overall Bargaining	11.44	2.35	10.43	2.83	1.01***
Work Activities Bargaining	3.30	1.39	3.23	1.46	0.07
Home and Persona Activities	4.73	0.75	4.00	1.37	0.73***
Purchases Bargaining	3.41	0.94	3.20	0.99	0.21***

Notes: The table shows the set of variables that are used as dependent variables in the analysis. *significant at 10%; **significant at 5%; ***significant at 1%.

Table 2.5: IV Estimates of the Impact of the BDH Program over the Allocation of Time

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Housework Hours	Paid Work Hours	Leisure Hours	Community Hours	Housework Hours	Paid Work Hours	Leisure Hours	Community Hours
	Women				Men			
1st Stage Discontinuity	0.108***	0.108***	0.108***	0.108***	0.109***	0.109***	0.109***	0.109***
	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)
BDH RD LATE	1.950*	3.386*	-5.416**	0.391**	-0.832	-0.602	1.449	-0.284
	(1.162)	(1.908)	(2.272)	(0.195)	(0.686)	(1.494)	(1.023)	(0.208)
Polynomial	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear
Controls	✓	✓	✓	✓	✓	✓	✓	✓
N	3,369	3,369	3,369	3,369	3,369	3,369	3,369	3,369

Notes: The table shows the estimated effect of being eligible for the BDH cash transfer program on time allocation to housework, paid work, leisure and community activities for women an men head or spouse within the household. The sample includes two-parent households with individuals older then 18 years of age and children under 18 years old. The treatment effects are measured in hours per day and each come from IV regression. Clustered standard errors at the village level in parentheses. *significant to 10%; **significant to 5%; ***significant to 1%.

Table 2.6: Robust Estimates of the Impact of the BDH Program over the Allocation of Time

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Housework Hours	Paid Work Hours	Leisure Hours	Community Hours	Housework Hours	Paid Work Hours	Leisure Hours	Community Hours
	Women				Men			
BDH								
Conventional	2.165**	3.142*	-5.432***	0.461***	-0.427	-0.870	1.300	-0.251
	(1.080)	(1.719)	(1.800)	(0.173)	(0.635)	(1.490)	(1.743)	(0.194)
Bias-corrected	2.358**	3.823**	-6.751***	0.572***	-0.614	-1.433	1.806	-0.276
	(1.080)	(1.719)	(1.800)	(0.173)	(0.635)	(1.490)	(1.743)	(0.194)
Robust	2.358**	3.823*	-6.751***	0.572***	-0.614	-1.433	1.806	-0.276
	(1.185)	(1.956)	(1.989)	(0.190)	(0.728)	(1.666)	(1.901)	(0.212)
Controls	✓	✓	✓	✓	✓	✓	✓	✓
N	9,985	9,985	9,985	9,985	9,985	9,985	9,985	9,985
Effective N	4,661	4,158	4,704	4,389	5,198	4,911	4,766	4,749

Notes: The table shows the estimated effect of being eligible for the BDH cash transfer program on time allocation to housework, paid work, leisure and community activities for women an men head or spouse within the household. The treatment effects are measured in hours per day and each come from a fuzzy regression discontinuity using the methodology proposed by Calonico, Cattaneo and Titiunik 2014*a* and Calonico et al. 2018. Clustered standard errors at the village level in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%.

Table 2.7: IV Estimates of the Impact of the BDH Program on Women's Decision Making (NLPCA Index)

	(1)	(2)	(3)	(4)
	Overall	Working Decisions	Home and Personal Activities Decisions	Purchases Decisions
1st Stage Discontinuity	0.117***	0.117***	0.117***	0.117***
	(0.031)	(0.031)	(0.031)	(0.031)
BDH RD LATE	1.943***	0.914	2.070***	1.199**
	(0.655)	(0.644)	(0.653)	(0.570)
Polynomial Terms	Linear	Linear	Linear	Linear
Controls	✓	✓	✓	✓
N	3369	3369	3369	3369

Notes: The table shows the estimated effect of being eligible for the BDH cash transfer program on the overall women's decision making index as well as on the decision making index related to working activities, home and personal activities and purchases. Each index was constructed using categorical principal component algorithm for optimal scaling. The treatment effects are measured in standard deviations of the decision making index and each come from IV regression. Clustered standard errors at the village level in parentheses. *significant to 10%; **significant to 5%; ***significant to 1%.

Table 2.8: Robust Estimates of the Impact of the BDH Program on Women's Decision Making (NLPCA Index)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Overall	Overall	Working Decisions	Working Decisions	Home Decisions	Home Decisions	Purchases Decisions	Purchases Decisions
BDH								
Conventional	1.903***	1.871**	0.938	1.140	2.198***	2.597***	0.939*	0.517
	(0.716)	(0.844)	(0.712)	(0.889)	(0.701)	(0.900)	(0.560)	(0.682)
Bias-corrected	2.011***	1.736**	1.126	1.219	2.456***	2.603***	0.778	0.278
	(0.716)	(0.844)	(0.712)	(0.889)	(0.701)	(0.900)	(0.560)	(0.682)
Robust	2.011**	1.736*	1.126	1.219	2.456***	2.603***	0.778	0.278
	(0.859)	(0.969)	(0.831)	(1.008)	(0.826)	(1.002)	(0.670)	(0.777)
Polynomial Terms	Linear	Quadratic	Linear	Quadratic	Linear	Quadratic	Linear	Quadratic
Controls	✓	✓	✓	✓	✓	✓	✓	✓
N	9985	9985	9985	9985	9985	9985	9985	9985

Notes: The table shows the estimated effect of being eligible for the BDH cash transfer program on the overall women's decision making index as well as on the decision making index related to working activities, home and personal activities and purchases. Each index was constructed using categorical principal component algorithm for optimal scaling. The treatment effects are measured in standard deviations of the decision making index and each come from a fuzzy regression discontinuity using the methodology proposed by Calonico, Cattaneo and Titiunik 2014*a* and Calonico et al. 2018. Clustered standard errors at the village level in parentheses. *significant to 10%; **significant to 5%; ***significant to 1%.

Chapter 3

Child Labor, Schooling and Idleness in the Presence of Cash Transfers

3.1 Introduction

According to the International Labor Organization, there are about 152 million children around the world performing different type of work activities. Among them, more than 70 million work in hazardous conditions in agriculture, mining, domestic labor, and other sectors that expose them to conditions that are harmful for their physical, mental and educational development. Most of these children live in poor countries. The eradication of child labor worldwide has long been a goal of many governments and international organizations. In the case of Latin America, many governments have implemented cash transfer programs to mitigate child labor with the intention to provide better conditions for poor households and allow parents send their children to school rather than the labor market.

Several studies have measured the effects of cash transfer programs on children's school participation and labor market participation. Despite these efforts, there are still important limitations which require further investigation. Most of the theoretical and empirical literature on child labor fails to distinguish between alternative non-work activities, implicitly treating schooling as the only alternative to work. An important omission is not considering the category "idleness" (those who neither work nor study), as well as overlooking children that work and study at the same time. In this paper, I implement an econometric choice model to estimate the effect of the cash transfer on the probability that children participate in a particular activity. I also estimate the effect of the transfer on children's time allocation and decompose the effects into extensive and intensive margins. Using data from a randomized control trial in Ecuador, I find that separately accounting for different choices is very important when looking at the effect of transfer policies. Specifically, I find important effects of the cash transfer on the probability of children participating in the different available activities, as well as effects on children's allocation of work time. Then, to rationalize the results, I propose a model of household decision making that highlights how cash transfers and children's skills endowment determine parents' decisions on children's activities.

Child labor could play an important role in perpetuating poverty in developing

countries. Households' lack of resources, combined with credit constraints, may reduce the likelihood of investing in the human capital accumulation of children, inducing families to expose children to work activities. This situation will likely reduce future earnings, which would reproduce and perpetuate poverty and inequality to the next generation.

Many of the studies that analyze household child labor decisions consider education and child labor as substitutes. For example, Rosenzweig and Evenson (1977) use a household time-allocation model that explicitly considers the economic contribution of children in agricultural areas and empirically documents that better local labor market opportunities for children lower school enrollment. Basu and Pham (1998) explain, using a multiple equilibrium model, that children work only to support household subsistence. They suggest that the level of wages defines the parents' choice to send their children to work. In the same way, Dessy (2000) shows the existence of a threshold on adult wages that determines the supply of child labor. Other studies have also analyzed the trade-off between child labor and the accumulation of human capital. For instance, Baland and Robinson (2000) show that child labor may exist due to the credit constraints that preclude parents from borrowing against the future income of children. In the same line, Ranjan (2001) explains that liquidity constraints are a driver of inefficiently high levels of child labor. He also shows that the incidence of child labor is positively related with inequality in the distribution of income. There are several studies in the empirical literature that evaluate many of the implications of these theoretical models (for example, Ravallion and Wodon 2000; Bourguignon, Ferreira and Leite 2003; Beegle, Dehejia and Gatti 2006; Manacorda 2006; Schady et al. 2008; Edmonds and Schady 2012).

Turning to cash transfers and child labor, the existing literature has analyzed the effects of cash transfer programs on children's school participation (Glewwe and Olinto 2004; Schady et al. 2008; Fiszbein et al. 2009; Saavedra and Garcia 2012; Baird et al. 2014) and on labor market participation (Fiszbein et al. 2009; Edmonds and Schady 2012; De Hoop and Rosati 2014; Edmonds and Shrestha 2014). An important finding in these studies is the influence of costs associated with schooling and the inherent trade-off between current household income and the future income of the

child. Some studies have examined the potential effect of cash transfers in households' investment decisions regarding children's education (Das, Do and Ozler 2005; Fiszbein et al. 2009). A branch of the literature has also suggested that increases in income—including contributions from cash transfer programs—may influence household decisions and reduce the necessity of sending the child to the labor market as a self-insurance mechanism (Beegle, Dehejia and Gatti 2006; De Janvry et al. 2006).

However, the theoretical and empirical literature on cash transfers and child labor has not put enough emphasis in modeling a comprehensive framework that acknowledges the different activities available for children, and instead it has mainly analyzed household decisions using a dichotomous decision framework related to child schooling and work. In this context, considering available choices such as work and study at the same time or neither work nor study, is an important feature in evaluating the effect of cash transfers on child school and labor market decisions. Deb and Rosati (2002) and Rosati and Tzannatos (2006), document that a significant portion of children can be considered as neither in school nor engaged in outside work. Similarly, Biggeri et al. (2003) study the phenomenon of idleness and suggest that children can be absent from both school and economic activity due to household chores, illness or job search. However, they also found that a large proportion of children not in school or economic activity does not fall into any of these categories.

From the viewpoint of traditional economic theory, it may seem strange that utility maximizing households will choose idleness over work or schooling for their children. To understand the phenomenon of idleness, in the theoretical section I introduce child leisure into the household utility function and educational cost into the budget constraint. The model shows that parents in poor households may optimally choose the option neither work nor attending school when the child is endowed with a low endowment of ability. Furthermore, I study how the provision of a cash transfer distorts this household optimal decision. The implications of the theoretical model try to explain the empirical results. These results suggest that the cash transfer decreases the probability of parents' choosing no school and no work, decreases the probability of parents' choosing work and no school, and increases the probability of choosing school and no work, but it has negligible effects on the probability of

choosing work and school.

Doepke and Zilibotti (2005) and Edmonds and Schady (2012) have emphasized the importance of understanding economic factors that affect child time allocation as an important component for designing effective child labor regulations and policies. Therefore, I also examine the impact of the cash transfer program on children's time allocation of time. To analyze the effect of the cash transfer on working hours (intensive margin), I estimate a two-stage model. In the first stage, I estimate the household discrete choice with respect to child activities and in the second stage, I measure the effect of the cash transfer on the number of hours the child devotes to work activities.

In the next section, I present the most important features of the program and describe the data. Section 3 shows the empirical models that are going to be used to measure the effect of the cash transfer program on the outcomes of interest and the estimation results. Section 4 presents a theoretical model that rationalize the results of my empirical analysis. Section 5 concludes.

3.2 The Program and the Data

3.2.1 Overview of the Program

As it was mentioned in Chapter 2, 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 the elimination of subsidies and didn't required any actions of the beneficiaries of the program. After five years, in 2003, the program was restructured and merged with the *Beca Escolar* program, which transferred monthly 5 USD per child up to two children per household, conditional on children's enrollment in school (and a 90% attendance rate). This new combined cash transfer program was called *Bono de Desarrollo Humano* (BDH), and it had an open enrollment process that delegated the identification of beneficiaries to local authorities, who were considered to have reliable knowledge of the poor people in their local communities. Then the program changed and followed a human development approach and was implemented

following the recommendations of international organizations. This was the the first program to use a proxy means test (PMT) to target the poorest families in Ecuador. The main objective of this new program was to improve the targeting mechanism of this social policy, as well as to contribute to human capital formation. The change in the structure of the program required beneficiary families to enroll their children between the ages of 5 to 18 in school and maintain an attendance rate of 75% or higher. Even though the conditionality of the program was imposed since the creation of the BDH, the enforcement of these requirements became at most only partially effective only since 2007.

3.2.2 Data Description

The launch of the BDH was accompanied by an evaluation based on a randomized component in 4 of Ecuador's 24 provinces. Among the provinces selected for the randomized evaluation, a certain number of parishes were randomly drawn. (In Ecuador a parish is a unit of local government, with an average population of 26,503.) Within the selected parishes, a sample of 1,488 households was randomly selected for the evaluation.[1] The household selected for the analysis were randomly assigned to a treatment group called "lottery winners" and a control group called "lottery losers". On average, there are 14 lottery winners age 11-16 at baseline and 13 lottery losers per evaluation parish. Then a baseline (collected between June and August 2003) and a follow-up survey (collected between January and March 2005) for the BDH evaluation were implemented. Both surveys were carried out by the Catholic University of Ecuador, which is an independent educational institution with no association with cash transfer program design or implementation.[2] The survey includes a roster of household members, with several questions related to household members' socio-

[1]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 were 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.

[2]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).

demographic characteristics, time allocation and schooling for school-age children, presence of adults in the household, household expenditures and earnings of the child if working. Also, the level of attrition between baseline and follow-up is very low (94.1 percent of the baseline households were re-interviewed). In this study, I will use this database to evaluate the effect of the cash transfer on household decisions regarding child activities. For the analysis, I use households that have a child between 11 to 16 years old at the time of the baseline survey.

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 substantial contamination of the control group. This implies that examining the effect of the lottery provides a lower-bound estimate of the underlying treatment effects. Among the households that lost the lottery and should not receive the transfer, 38 percent received the transfers, whereas among the households that won the lottery, 69 percent received the transfer. Consequently, due to non-compliance with the experiment, comparing lottery winners and lottery losers is not equivalent to comparing actual recipients to non-recipients of the transfer. However, being a lottery winner household increases by 31 percentage points the probability of actually receiving the transfer. In this context, I will use the lottery as an instrument for actual receiving the transfers to estimate the effect of the transfer for individuals whose probability of receiving transfers was affected by the lottery. This is, Iestimate a local average treatment effect (LATE).

3.2.3 Types of Children's Activities

The database contains available information on children's school enrollment and work status. I use any work activity (paid employment plus unpaid work plus household chores) for defining children's work status. Using the variable that records whether the child is enrolled in school together with the work status defined as any work, I construct the first variable that characterize the different activities available for 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 combine the variable that records whether the child is enrolled in the school, but I disaggregate the any work variable into 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.

3.2.4 Descriptive Statistics

Table (3.1) presents selected descriptive statistics of children's activities, child time use, and household characteristics variables. All the numbers are based on the sample used for the analysis (1,883), differentiating between lottery winners and losers. All the households in the analysis are composed by at least one child between 11 to 16 years old at baseline.

Using the first categorization of child activities (using any work activities as the work status), 2 percent of children are neither working nor going to school at baseline, 5 percent are enrolled in school and not working, and 32 percent are only working. Children that work and are enrolled in school are around 61 percent, using this definition of child activities. Consider next the second definition of child activities, similarly as in the previous definition 2 percent of children are neither working nor going to school at baseline, while 5 percent are enrolled in school and not working. Using these alternative definition of child activities, 6 percent of children are not going to school and performing an economic activity, 8 percent of children are not going to school and performing household chores, 18 percent of children are not going to school and performing all work activities, 4 percent of children are going to school and performing an economic activity, 33 percent of children are going to school and performing household chores, and 25 percent of children are going to school and performing all work activities.

In terms of child time use, hours allocated to the different activities include children that did not participate in the activities; they are coded as having zero hours

in the corresponding activity. Overall, children allocate about 10 hours to economic activities, which can be divided into about 4 hours 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.[3] Table (3.1) shows that hours in unpaid household services are not balanced between lottery winners and losers. This 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.

The household characteristics in Table (3.1) appear to be balanced between lottery winners and losers, except for gender. It is also important to note that among low-income children there is substantial participation heterogeneity in the different activities at the different ages. Figure (C.1) shows participation rates and age at baseline for the different child activities: no school no work (idleness), work and no schooling, work and schooling, and schooling and no work. Regardless of the definition for child work, the child participation rate for no school and no work and for work and no school increases with child age. However, the rise in work and no school is much steeper using the second characterization of child activities. The participation rate for school and no work is decreasing with age, whereas both work and school is pretty low and stable using the first characterization of child activities and relative high and decreasing using the second and third characterization of child activities.

3.3 Empirical Analysis

The primary goal of the empirical exercise is to estimate the effect of the cash transfer on the household decisions regarding child activities (schooling, work. idleness), and the effect 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 second part of the analysis identifies the effect of the cash

[3]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

transfer on the child's allocation of working time and implements a decomposition of that effect into its extensive and intensive margins.

3.3.1 Modeling Household Decisions

The household faces a discrete choice with four possible options in relation to the various child activities: no school 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 competing alternatives on the choice set C_i. The utility that the household obtains from alternative $j \in C_i$ is given by:

$$U_{ij} = X_i\beta + Z_i\phi + \epsilon_{ij} \tag{3.1}$$

where Z is the variable of interest and represent being a lottery winner or loser, X is a vector of observed exogenous variables, and ϵ represents the unobserved part of the utility that captures the effects of unmeasured choice attributes such as 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. This approach uses only the randomized assignment into treatment and control groups, and does not take into consideration the endogeneity regarding actually receiving the cash transfer.

In order to address this issue, it is also possible to use the randomized selection into study groups as an instrument for actual reception of the cash transfer. Consider again the utility that household obtains from alternative j:

$$U_{ij} = X_i\beta + T_i\gamma + \varepsilon_{ij} \tag{3.2}$$

in this case, T represents receiving the cash transfer, X is a vector of observed exogenous variables that affect household utility derived from choice j, and ε represents the unobserved part of the utility. The econometric problem arises because ε may not be

independent of T, as assumed by standard estimation methodologies. To overcome this problem, I follow Petrin and Train (2010) and use a control function approach. The idea behind this correction procedure is to derive a proxy variable that conditions on the part of T that depends on ε. If this can be done, then the remaining variation in the endogenous variable will be independent of the error and standard estimation approaches will again be consistent.

To show the fundamentals of the control function approach, rewrite Equation (3.2) as:

$$U_{ij} = X_i\beta + T_i\gamma + \xi_{ij} + e_{ij} \tag{3.3}$$

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 written 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 specified as linear in X, Z plus a separable error:

$$T_i = X_i\pi + Z_i\delta + \mu_i \tag{3.4}$$

The objective is to to build an auxiliary variable, which when added to the systematic part of the utility function, will control for the endogenous component of the error term. It can be shown that the conditional expectation of ξ, given v, can play this role (Wooldridge, 2010). Assuming then that ξ and μ are jointly normal, this conditional expectation would be linear:

$$\xi_{ij} = \mu_i\theta + v_{ij} \tag{3.5}$$

where v will be independent of μ and will follow a normal distribution with zero mean and a fixed variance σ_v^2. Under these conditions, the error term v will not be correlated with T or X. The practical problem that μ is not observed can be addressed, for example, by noting that μ can be consistently estimated by the residuals $\hat{\mu}$ of the OLS regression of T on X and Z. Then, if $\hat{\mu}$ is inserted into the choice model,

the consistency of the estimators of the model parameters would be guaranteed by the Slutsky theorem (see, e.g. Ben-Akiva and Lerman 1985).

This method to address endogeneity in discrete choice models has been widely discussed in the literature (see for instance, Rivers and Vuong 1988; Guevara and Ben-Akiva 2006; Petrin and Train 2010). A cautionary note has been suggested by Wooldridge (2015) when using these types of models and there is 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 (3.4) using a probit specification, construct a generalize residual using the inverse Mills ratio (IMR) and the add this term in the second stage equation. I implement this procedure in the estimation of parameters and then bootstrap the standard errors (clustering at the parish level) for inference purposes.

3.3.2 Decomposing Effects 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 important, as intensive margin effects indicate that treatment is changing the exposure of children to undesirable activities. I follow the approach proposed by Attanasio, Kugler and Meghir (2011) and Carranza et al. (2019) to decompose time allocation effects into extensive and intensive margins. The decomposition propose in Equation (3.6) is for working hours, however the same procedure applies to the other the time allocation outcomes. Using the law of iterated expectations and the fact that observed hours are zero for non-employed children, it is possible to write the intention to treat effect on work hours as:

$$\underbrace{\mathbb{E}\left[Hours \mid Z=1\right]-\mathbb{E}\left[Hours \mid Z=0\right]}_{ITT\ for\ hours}$$
$$=\underbrace{\left(\mathbb{E}\left[Hours \mid Z=1, W=1\right]-\mathbb{E}\left[Hours \mid Z=0, W=1\right]\right)}_{ITT\ for\ hours \mid employment}\cdot \underbrace{Pr\left[W=1 \mid Z=1\right]}_{Lottery\ winners\ employment\ rate}$$
$$+\ \underbrace{\mathbb{E}\left[Hours \mid Z=0, W=1\right]}_{Lottery\ losers\ earnings \mid employment}\cdot\underbrace{\left(Pr\left[W=1 \mid Z=1\right]-Pr\left[W=1 \mid Z=0\right]\right)}_{ITT\ for\ employment} \tag{3.6}$$

the first line on the right-hand side of Equation (3.6) is the intensive margin effect. If the lottery only changes the employment rate but has no effect on hours for employed children, then this term is zero. The second line on the right-hand side of Equation (3.6) is the extensive margin effect. If the lottery has no effect on the employment rate, then this expression is zero. Intuitively, the extensive margin effect on hours is the intention to treat effect on employment multiplied by the mean hours for employed 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 (3.6), 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 using the formula in Equation (3.6) I construct a program that implements this computation estimating all quantities as a system and bootstrapping the standard errors for inference purposes. We can follow a similar procedure to decompose the the local average treatment effects. Details of the procedure are provided in Appendix C.2.

3.3.3 Results

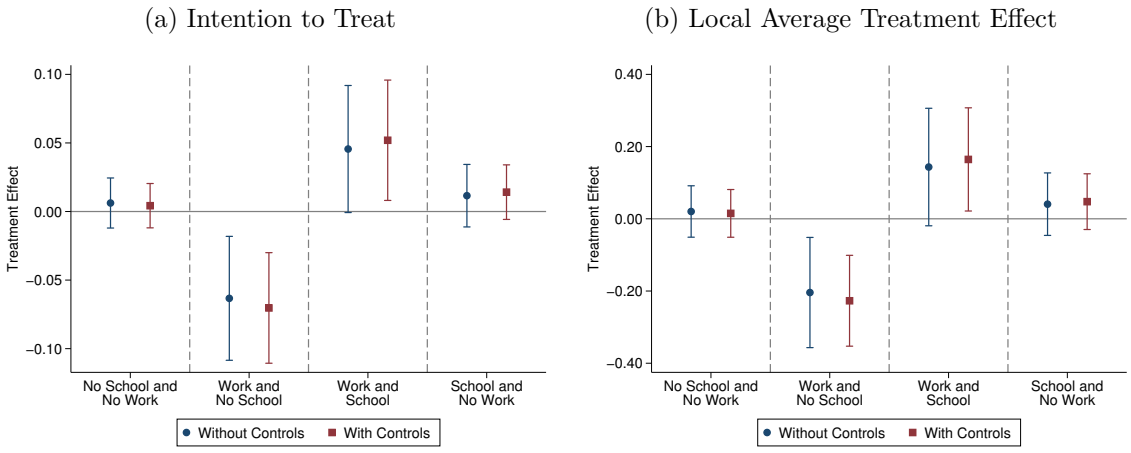
Household Decisions

The results of the discrete choice models that estimate the effect of the cash transfer on the probability of selecting a particular activity for the children are reported in Tables (3.3) to (3.4). The first two rows of each table contain the first stage results that can be interpreted as the intention to treat (ITT) effect of the lottery. The third and fourth rows contain the two-step procedure results that can be interpreted as

the local average treatment effect (LATE) of the cash transfer. Table (3.3) shows the main results. I have also estimated heterogeneous effects over Boys and Girls in Table (3.3), and in Table (3.4) I show the result using the alternative definition of children's activities.

The results in Table (3.3) show that the lottery does not have an effect on the probability that the household chooses child idleness. The two-stage estimation (LATE) results indicate that receiving the cash transfer slightly increases the probability of choosing child idleness by around 1.5 percentage points, however this effect is not statistically significant. An important goal of the cash transfer program is to mitigate child work, and the results in Table (3.3) show that the program is successful in meeting this goal, when any work is used for children's work status. In the third and fourth columns of Table (3.3), the effect of winning the lottery on the probability that a household send the 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. Using this definition, the program does have an effect on the likelihood that the household selects the option work and school for the child. The fifth and sixth columns of Table (3.3) shows that the lottery increases the the probability of sending the child concurrently to work and school by 5.2 percentage points. Correspondingly, we see that the effects of the cash transfer is sizable (16.4 percentage points). Table (3.3) also shows that, under this alternative definition of child work, the program has slightly improved the children's likelihood of attending school and not working. The last two columns of Table (3.3) show that the lottery increases the probability that the household chooses only schooling by 1.4 percentage points. In the same perspective, receiving the cash transfer increases the probability of choosing only school by 4.7 percentage points. However, these effects are not statistically significant. These effects are summarized in Figure (3.1).

Figure 3.1: Effect of the Cash Transfer on Child Activities (Using Any Work Activities)



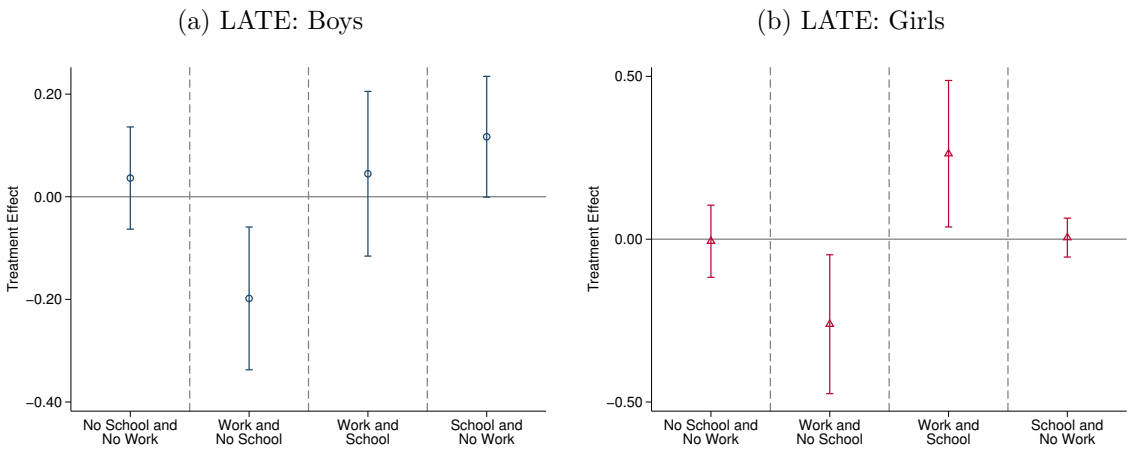
Notes: The figure shows the estimated effects of the cash transfer program on child activities. The left panel shows the estimated marginal effect of being eligible for the CCT program (ITT) whereas the right panel shows the effect of receiving the CCT program (LATE) on the household decision related 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, indicator for rural area, indicator if head of household head was male and indicator if child speaks indigenous language. Standard errors in parenthesis are bootstrapped and clustered at the parish level with 1000 replications.

Overall, these results suggest that the most prevalent behavioral shift caused by the program was a reduction in the probability that the household decide only sending the child to work, an increase in the probability that the household chooses concurrently work and school, and an increase in the likelihood that a household chooses schooling only for the child.

Next, consider the heterogeneous effects of the program for boys and girls. Table (3.4) shows the effect of the program on child activities differentiating among boys and girls. There are some differences among these groups. First, the effect of winning the lottery on the probability that a household chooses idleness for boys and girls is statistically not significant. The effect of receiving the cash transfer increases the probability of choosing idleness by 3.6 percentage points for boys, and reduces the

probability of choosing idleness by 0.6 percentage points for girls. These effects are not statistically significant. On the other hand, the impact of the lottery on the probability that a household sends the boy only to work is reduced by 6.5 percentage points, whereas for girls the reduction is 7.5 percentage points. Accordingly, the effect of receiving the cash transfer decreases the probability of choosing work and no school by 19.8 percentage points for boys, and 26.1 percentage points for girls. These effects are statistically significant. Despite this positive effect in terms of reducing child labor, it appears that the program has no effect on the likelihood that the household selects the option school and work only for boys. In the fifth and sixth columns of Table (3.4), the lottery increases the probability of school and work by 2 percentage points, and the cash transfer increases the probability of choosing school and work by 4.5 percentage points for boys. These effects are not statistically significant. On the other hand, for girls, the lottery increases the probability of school and work by 7.6 percentage points, and the cash transfer increases the probability of choosing school and work by 26.2 percentage points. These effects are statistically significant. Since these are poor households, children with sufficiently high abilities will be sent to work and to study. The cash transfer does not always change the probability of choosing this option. 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 3.5 percentage points and receiving the cash transfer increases the probability of choosing only school for boy by 11.7 percentage points. For gorls the effects are very small and not statistically significant. The complete set of results of the LATE are compiled in Figure (3.2).

Figure 3.2: Effect of the Cash Transfer Program on Household Decisions over Boys and Girls Activities



Notes: The figure shows the estimated effects of the cash transfer program on child activities. The left panel shows the estimated marginal effect of receiving the CCT program (LATE) on the household decision related to boys activities whereas the right panel shows the effect of receiving the CCT program on the household decision related to girls 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, indicator for rural area, indicator if head of household head was male and indicator if child speaks indigenous language. Standard errors in parenthesis are bootstrapped and clustered at the parish level with 1000 replications.

Lastly, the results in Table (3.5) 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 remain consistent with the effects obtained in the previous model. Yet, there are some important differences. The impact of the lottery on the probability that a household sends the children only to work in economic activities (paid and unpaid) is reduced is reduced by 3.2 percentage points. Similarly, the effect of receiving the cash transfer decreases the probability of choosing economic activity and no school by 10.2 percentage points. On the other hand, the sixth column of Table (3.5) shows that the lottery increases the probability of choosing school and household chores by 6.9 percentage points, and the cash transfer increases the probability of choosing school and househol chores by 21.7

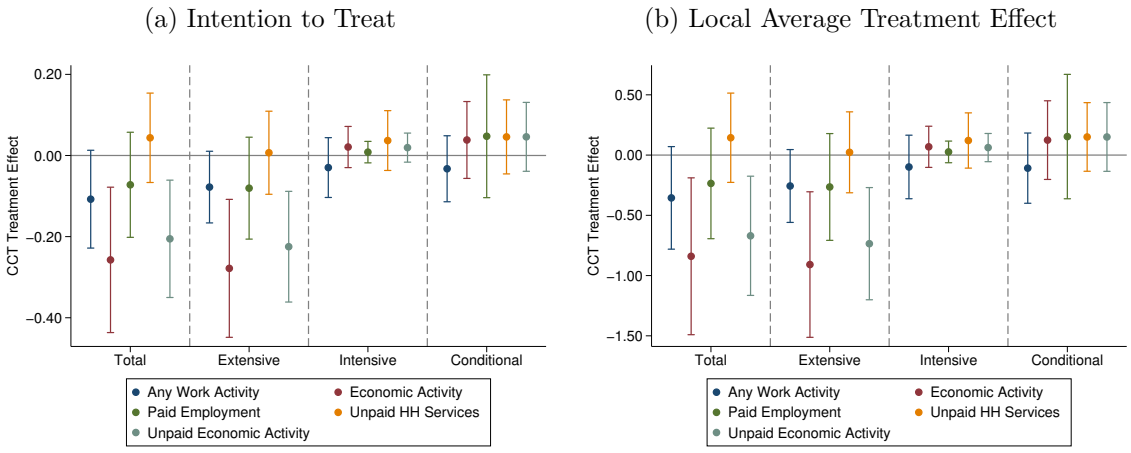
percentage points. These effects are statistically significant. Finally, the last column of Table (3.5) shows that the lottery increases the probability that the household chooses only schooling by 1.2 percentage points. In the same perspective, receiving the cash transfer increases the probability of choosing only school by 4.6 percentage points. However, these effects are not statistically significant.

Household Decisions and Working Hours

The results of the decomposition exercise are presented in Tables (3.6) and (3.7). These results are concisely plotted in the first panel of Figure (3.3). Table (3.6) shows the intention to treat (ITT) of the lottery on working hours. We see that child allocation of time to any work activities (paid employment plus unpaid work plus housework) decreases by 11 percent, while child allocation of time to economic activities (paid employment plus unpaid work) falls by 26 percent, and child allocation of time to unpaid economic activities decrease by 21 percent. The program do not have any effect on the allocation of time to paid employment and unpaid household services. The decomposition shows that the entire effect on hours is explained by the extensive margin effect. This suggests that children in lottery winner households do not work shorter number of hours conditional on participating in the activity, they are just less likely to be performing that particular activity.

Table (3.7) shows of the local average treatment effect (LATE) of the cash transfer on working hours. Child allocation of time to economic activities falls by 84 percent and child allocation of time to unpaid economic activities decrease by 67 percent. The transfer does no have any effect on the allocation of time to any work activity, paid employment and unpaid household services. Again, the decomposition shows that the entire effect on hours is explained by the extensive margin effect. Therefore, the cash transfer does not influence 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.

Figure 3.3: Decomposition of the Effect of the Cash Transfer on Hours Allocated to Different Activities



Notes: The figure shows the estimated effects of the cash transfer program on child activities. The left panel shows the estimated marginal effect of being eligible for the CCT program (ITT) whereas the right panel shows the effect of receiving the CCT 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, indicator for rural area, indicator if head of household head was male and indicator if child speaks indigenous language. Standard errors in parenthesis are bootstrapped and clustered at the parish level with 1000 replications.

3.4 How can we rationalize these results?

In the previous section, I estimated several econometric models that quantify the effect of the cash transfer on households' decisions regarding child activities as well the allocation of hours to working activities. In this section, I propose a simple theoretical framework that explains the behavior of households when they receive the program. In particular, I show that the main mechanism through which an exogenous windfall of resources (due to the cash transfer) might affect the decisions of the family regarding child activities and allocation of time.

The main mechanism explained by this model is how the interaction between

household resources (affected by an exogenous cash transfer), child wages, school costs and child-specific attributes such as ability affect the optimal determination of household decisions related to schooling and work. By modeling the cash transfer as a subsidy of the human capital input and as lump sum transfer, this model also contributes to the discussion of whether cash transfers should be conditional (on school enrollment) or unconditional.

3.4.1 Model Setup

Consider a household formed by two agents: one parent and one child. In this framework the parent make all the decisions.[4] 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 has to decide how much time the child allocates to these three activities. The household derives utility from a consumption good purchased in the the market, denoted by q, the human capital of the child, denoted by Q, and from the leisure time of the child, denoted by h. Let's denote the household utility function by:

$$U(q, Q, h) \tag{3.7}$$

with $U_j > 0$ for $j \in \{q, Q, h\}$ and assume for simplicity a quasi-concave structure in its arguments. Assume also that the autonomous income of the parent is given by y. A child is also 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.[5] Allocating time to schooling is costly. Therefore there is a direct cost of schooling $c > 0$ proportional to the time allocated to schooling. On the other hand, if a child with market ability v^w, allocates a fraction l 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

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

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

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. In this context, the household budget constrain is given by:

$$q + (c - \tau^s)\, s = y + v^w wl + \tau \tag{3.8}$$

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

$$Q = Q\left(s, v^s\right) \tag{3.9}$$

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

3.4.2 Household's Optimization

The household has to decide the amount of time that the child will devote to the different activities. Given the policy duplet (τ^s, τ), the household solves the following problem:

$$\begin{aligned} \max_{s,l,h} \quad & U\left(q, Q, h\right) \\ \text{subject to :} \quad & \\ & q + (c - \tau^s)\, s = y + v^w wl + \tau \\ & Q = Q\left(s, v^s\right) \\ & s + l + h = 1 \\ & s \geq 0, l \geq 0, h > 0 \end{aligned} \tag{3.10}$$

The first and second constraints represent the household budget constraint and the relationship between the human capital accumulation and the required amount of inputs, respectively. Note that the lump sum cash transfer enters directly into the budget constraint implying that the household has more resources to allocate to the consumption good purchased in the market and to schooling. 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 constraint that leisure must be greater than zero, which means that it is not possible for the child to have zero leisure.

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

$$-\frac{\partial U}{\partial q}(c-\tau^s)+\frac{\partial U}{\partial Q}\frac{\partial Q}{\partial s}=1 \tag{3.11}$$

$$\frac{\partial U}{\partial q}(v^w w)=1 \tag{3.12}$$

Combining Equations (3.11) and (3.12) yields:

$$\frac{\partial U}{\partial Q}\frac{\partial Q}{\partial s}=\frac{\partial U}{\partial q}(v^w w-c+\tau^s) \tag{3.13}$$

Equation (3.13) requires that the marginal benefit from devoting resources to the input of human capital accumulation equals the opportunity cost of not spending the resources on the market good. This condition can also be interpreted in terms of the household's willingness to pay for the market good and schooling.

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 Langrange multipliers, are the following:

$$\frac{\partial \mathcal{L}}{\partial s}=\frac{\partial U}{\partial Q}\frac{\partial Q}{\partial s}-\frac{\partial U}{\partial q}\frac{\partial q}{\partial s}\leq \lambda+\phi, s\geq 0, s\frac{\partial \mathcal{L}}{\partial s}=0 \tag{3.14}$$

$$\frac{\partial \mathcal{L}}{\partial h}=\frac{\partial U}{\partial h}-\frac{\partial U}{\partial q}\frac{\partial q}{\partial h}\leq \mu+\phi, h\geq 0, s\frac{\partial \mathcal{L}}{\partial h}=0 \tag{3.15}$$

$$\frac{\partial \mathcal{L}}{\partial \lambda}=1-s\geq 0, \lambda\geq 0, \lambda\frac{\partial \mathcal{L}}{\partial \lambda}=0 \tag{3.16}$$

$$\frac{\partial \mathcal{L}}{\partial \mu} = 1 - h \geq 0, \mu \geq 0, \mu \frac{\partial \mathcal{L}}{\partial \mu} = 0 \tag{3.17}$$

$$\frac{\partial \mathcal{L}}{\partial \phi} = 1 - s - h \geq 0, \phi \geq 0, \phi \frac{\partial \mathcal{L}}{\partial \phi} = 0 \tag{3.18}$$

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

3.4.3 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:

$$\frac{\partial \mathcal{L}}{\partial s} = \frac{\eta v^s}{\alpha + \eta s v^s} - \frac{v^w w + (c - \tau^s)}{y + v^w w - s\left(v^w w + (c - \tau^s)\right) - v^w w h + \tau} \leq \lambda + \phi, s \geq 0, s \frac{\partial \mathcal{L}}{\partial s} = 0 \tag{3.19}$$

$$\frac{\partial \mathcal{L}}{\partial h} = \frac{\psi}{h} - \frac{v^w w}{y + v^w w - s\left(v^w w + (c - \tau^s)\right) - v^w w h + \tau} \leq \mu + \phi, h \geq 0, s \frac{\partial \mathcal{L}}{\partial h} = 0 \tag{3.20}$$

Case 1: No school and 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 (3.14) holds with equality while Equation (3.15) holds with inequality. Therefore, the FOCs have to satisfy:

$$\frac{\eta v^s}{\alpha} < \frac{v^w w + (c - \tau^s)}{y + \tau} + \phi \tag{3.21}$$

$$\psi = \frac{v^w w}{y + \tau} + \mu + \phi \tag{3.22}$$

Equations (3.21) and (3.22) imply that for this case, the parameters have to satisfy:

$$y > \frac{v^w w}{\psi} - \tau \tag{3.23}$$

$$y < \frac{\alpha\left(c - \tau^s\right)}{\eta v^s - \psi\alpha} - \tau \tag{3.24}$$

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 (3.14) holds with equality while Equation (3.15) holds with inequality. Therefore, the FOCs have to satisfy:

$$\frac{\eta v^s}{\alpha} < \frac{v^w w + \left(c - \tau^s\right)}{y + v^w w - v^w w h + \tau} \tag{3.25}$$

$$\frac{\psi}{h} - \frac{v^w w}{y + v^w w - v^w w h + \tau} \tag{3.26}$$

Given that $l > 0$ and $h > 0$, $l + h = 1$, then $h < 1$. Therefore, from Equation (3.25) and (3.26) the range of parameters for this case are:

$$y < \frac{v^w w}{\psi} - \tau \tag{3.27}$$

$$v^s < \frac{\left(v^w w + \left(c - \tau^s\right)\right)\left(1 + \psi\right)\alpha}{\eta\left(y + v^w w\right) + \tau} \tag{3.28}$$

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 (3.14) and (3.15) both hold with equality. Therefore, the FOCs have to satisfy:

$$\frac{\eta v^s}{\alpha + \eta s v^s} = \frac{v^w w + \left(c - \tau^s\right)}{y + v^w w - s\left(v^w w + \left(c - \tau^s\right)\right) - v^w w h + \tau} \tag{3.29}$$

$$\frac{\psi}{h} = \frac{v^w w}{y + v^w w - s\left(v^w w + \left(c - \tau^s\right)\right) - v^w w h + \tau} \tag{3.30}$$

Using Equations (3.29) and (3.30), I can characterize s and h as :

$$s = \frac{y + v^w w + \tau}{\left(v^w w + (c - \tau^s)\right)(2 + \psi)} - \frac{(1 + \psi)\,\alpha}{\eta v^s\,(2 + \psi)} \tag{3.31}$$

$$h = \frac{(y + v^w w + \tau)\,\psi}{v^w w\,(2 + \psi)} + \frac{\psi\left(v^w w + (c - \tau^s)\right)\alpha}{v^w w\,(2 + \psi)\,\eta v^s} \tag{3.32}$$

In order for $l > 0$, we need $s + h < 1$. Therefore, using Equations (3.31) and (3.32), the parametric restrictions for this case are given by:

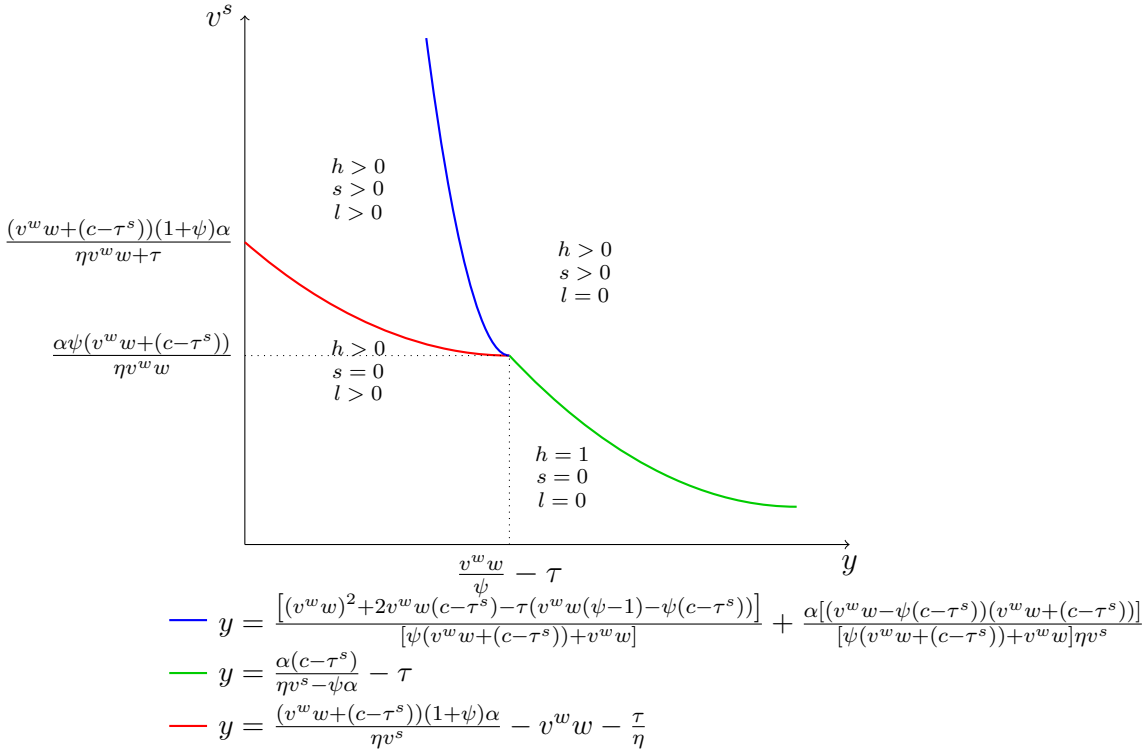
$$\begin{aligned} y < \frac{\left[(v^w w)^2 + 2v^w wc - \tau\left(v^w w\,(\psi - 1) - \psi\,(c - \tau^s)\right)\right]}{\left[\psi\left(v^w w + (c - \tau^s)\right) + v^w w\right]} + \\ \frac{\alpha\left[\left(v^w w - \psi\,(c - \tau^s)\right)\left(v^w w + (c - \tau^s)\right)\right]}{\left[\psi\left(v^w w + (c - \tau^s)\right) + v^w w\right]\eta v^s} \end{aligned} \tag{3.33}$$

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 (3.14) and (3.15) hold with equality. This represents the residual area obtained after taking into consideration the other three cases.

An analytical partitioning of the parameter space with all these four cases is shown in Figure (3.4). With this structure one can analyze possible changes in activity patterns. Children with low school ability and a low level of 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 will 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 resources constrained household will maintain the decision to send the child to work, however the child will also be sent to school. Increase in both the lump sum cash transfer τ and the subsidy cash transfer τ^s reduce the thresholds for the only work decision, which implies a reduction in the likelihood of sending the child only to work, since the choice space for the only work scenario is reduced. On the other hand, a child with higher working ability will be more likely to only work instead of concurrently working and attending school.

Figure 3.4: Partitioning of Parameter Space for Household Decision of Child Activities



The phenomenon of children who neither work nor study (idleness) arises in households with a low school ability child. When this happens, parents may rather have the child stay at home. Idleness is persistent and does not change with only an increase in resources. Even a relative wealthy household with a low school ability child will choose idleness.[6] This implies that the lump sum style cash transfer τ and the subsidy style 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 the school instead of idleness will 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

[6]For example, an extreme case will be a child with mental disability, even if the household has resources, the child will be unable to attend school.

ability child will be more likely to change idleness to child work. As the child school ability starts to increase, a less resource constrained household will send the child to school only. Both types of cash transfer structures provide additional resources to the resource constrained household and expand the possibility that children endowed with some school ability, that live within this type of household, will only attend school and not work.

3.4.4 Numerical Illustration

This subsection presents a numerical example to illustrate the key results 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 situations of poor households. For the baseline specification, I normalize the autonomous income of the parent (y) to one. I set the child wage rate (w) to one and the value for the market ability (v^w) to two, which allows me to have a baseline child labor income that replicates the fact that median child labor earnings are greater than the transfer.[7] I set the schooling cost parameter (c) to 1, which produce and effective baseline schooling cost of 0.22.[8] Also, this allows me to express the transfer as a proportional reduction of this cost. Using these set of parameters together with the FOCs, I obtain the value of ψ, which is 1.23. Then, I calibrate the remaining parameters, depending on whether the transfer considered is a lump sum transfer or a subsidy of the human capital input, and on whether household decisions are continuous or discrete choice. I set the parameters values so that the model replicates a given time allocation structure. Specifically, I target child's hours worked in the labor market, schooling and leisure. The qualitative influence of most parameters is very intuitive and the values are displayed in Table (C.4). The optimizations have been numerically solved using a

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

[8]Typically, children spend around 33 hours a week in schooling (since time allocation is normalized to 1 this represents 0.22 in the model). So, the actual schooling cost is 0. 22*1=0.22 (22% of parent income), consistent with the data.

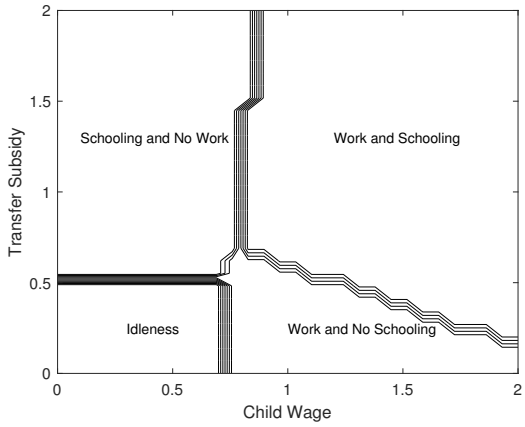
global optimization procedure.[9]

Discrete Household Decisions

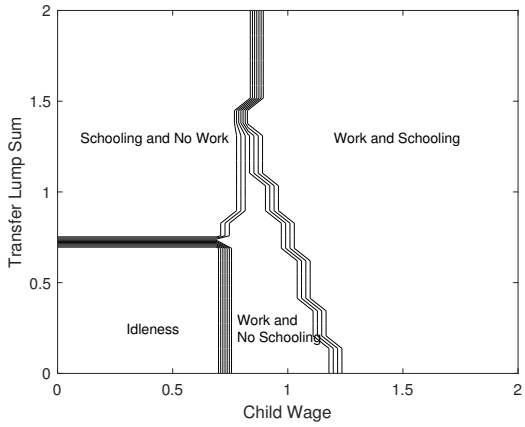
To be consistent with the data on household decisions at the extensive margin, I assume that each household can chose to be in one of the four different scenarios: no school and no work (idleness), work and no schooling, work and schooling, and schooling and no work. For example, if the family chooses to send the child to the school, s is set to 0.2 to represent approximately 34 hours of school time a week. Similarly, if the family chooses to send the child to work, l is set be 0.12 to represent around 20 hours of work in a week. Figure (3.5) shows the patterns of the equilibrium in relation to the amount of subsidy and the child wage.

Figure 3.5: Discrete Choice Comparative Statics

(a) Subsidy Scenario



(b) Lump Sum Scenario



Notes: The figure illustrates how equilibrium household decision reacts to different levels of the transfer and the child wage. These calculations come from solving the model under the parametric values assigned in Table (C.4).

For low levels of child wage and child subsidy, the household chooses idleness. When the level of child wage is high and child subsidy is low, then the household

[9]Specifically, I employed a Global Search Algorithm to find the global maximum using a scatter-search mechanism that generates, analyzes and rejects starting points in order to iteratively improve the best local minimum found.

chooses work and no schooling. Conversely, when the level of child wage is low and child subsidy is high, then the household chooses schooling and no work. Finally, when child wage and child subsidy are both relatively high the household chooses work and schooling. Note that with a lump sum cash transfer structure, the decision for the child to combine work and schooling, or to choose idleness, are more likely in comparison with the subsidy cash transfer structure.

Continuous Households Decisions

The following diagrams document how equilibrium the child's time allocation changes in reaction to different compositions of transfers and child wages, as well as different combinations of school ability and market ability. The allocation of time to the different activities is measured as proportions of the time endowment, which has been normalized to one.

The left diagrams of Figures (C.3) to (C.5) show the effect of the cash transfer under a subsidy structure on the equilibrium time allocation, whereas the right diagrams of Figures (C.3) to (C.5) represent the effect of a lump sum cash transfer structure. Qualitatively, the results are similar, however quantitatively they have some differences. In panels (a) and (b) of Figure (C.3), the lump sum cash transfer increases the allocation of time to school while child wage reduces the amount of time assigned to this activity. In contrast, the subsidy structure of the cash transfer is more effective in increasing school time; however, it is more sensitive to changes in the level of the child wage, compared to the lump sum structure. In panels (a) and (b) of Figure (C.4), the cash transfers and the child wage both reduce leisure time. This is reasonable since on one hand the transfer increases the child time allocated to school, whereas the child wage increases the allocation of time toward labor market activities. the subsidy structure of the cash transfer has a larger impact on the reduction of leisure time compared to the lump sum cash transfer structure. This is mainly driven by the greater influence that the subsidy structure has on increasing time in schooling.

Lastly, panels (a) and (b) of Figure (C.5) show that both types of cash transfers reduce the amount of time allocated to labor market activities. In both cases, when

the child wage is low the household decides not to send the child to work. As expected, an increase in the child wage makes child labor more attractive for the household. In this context, the subsidy cash transfer structure is slightly better in mitigating the allocation of time towards the labor market in comparison to the lump sum transfer structure, because it lowers the cost of child time in school.

The diagrams in Figures (C.6) to (C.8) show the the role of skills on the decisions to allocate time. In panels (a) and (b) of Figure (C.6), when child school ability is low the parent will not send the child to school. As the child school ability increases, the time devoted to school activities also increases. On the other hand, as the market ability increases this implies a higher opportunity cost of child school time and therefore the parent will make the child work and go to school. Note also noticeable, that in the subsidy scenario, the response of optimal allocation of hours towards schooling is more sensitive to both levels of abilities relative to the lump sum scenario.

The phenomenon of child idleness can be seen in panels (a) and (b) of Figure (C.7). The two scenarios look very similar. When child school ability and market ability ire both low, the parent will neither send the child to school nor engage the child in paid work activities. In this case, the child devotes all his or her endowment of time to leisure. With the increase in school ability, the time devoted to leisure starts to decrease, as the parent will choose to send the kid to school and therefore the child will allocate some time to school activities. Similarly, as market ability starts to increase, the parent will decide to send the child to work and therefore the child will allocate some time to work activities. When the child is endowed with higher abilities the idleness option starts to become unlikely since the opportunity cost of schooling and market work start to increase.

Panels (a) and (b) of Figure (C.8) show how skills affect the allocation of time to labor market activities. Child hours allocated to market work increase when the child is endowed with a higher market ability. On the other hand, market hours decrease as the child is endowed with a higher school ability, as this induces the parent to send the child to school. When a child is endowed with a low market ability, the parent does not send the child to work and instead the child may be in an idleness scenario or may be sent only to school, depending on the level of school ability.

It is important to acknowledge that in the context of poor households, decisions regarding child schooling, market work and idleness are related to the endowment of child abilities as well as the amount of available resources. The combination of parental altruism and household utility from child leisure also play an important role in household decisions regarding child activities. Governmental aid, in the form of cash transfers, will alter the households' available resources and, depending on the combination of school and market ability, the policy will have different effects in shifting the optimal decisions of the household regarding child activities. The next subsection provides a simple counterfactual analysis, that documents households' optimal decisions regarding child activities under different cash transfer scenarios versus a no cash transfer scenario.

3.4.5 Effect of the Cash Transfer

In this subsection, I explore the effects of providing a cash transfer to a poor household. Specifically, I show the changes in the optimal decisions of the household regarding child activities, when the liquidity constraint of the household is relaxed due to the different types of cash transfers. In each figure, the blue solid line depicts a situation under no transfers, the green dashed line represents the benchmark outcome with a cash transfer structure equivalent to 7 percent of the household income and the green solid line is a situation with a larger transfer equivalent to the full cost of schooling. In the horizontal axis, I plot the child school ability parameter. Also, I provide in each figure two panels that represents scenarios for low and high child market ability. Recall that school ability determines how much human capital the child accumulates, and market ability cab be understood as the aptitude and strength to engage in production that typically increases as the child grows. As before, the left diagrams of Figures (C.9), (C.10) and (C.11) show a scenario under a subsidy structure, while the right diagrams represent a scenario under a lump sum cash transfer structure.

In Figure (C.9), I show that a cash transfer increases the school time of children that live in beneficiary households (green lines) relative to non-beneficiary households

(blue line). The plots show that in situations where the child's school ability is very low, neither cash transfer structures exert a strong influence in shifting the allocation of time towards school activities. Note that in panel (a) and (c), a full subsidy structure affects the allocation of time, even for children with low school ability. Comparing panels (a) and (c) with panels (b) and (d), overall a subsidy cash transfer structure has a greater influence on increasing the amount of time devoted to schooling.

In a scenario with high market ability (panels (c) and (d) of Figure (C.9)), the child's opportunity cost of devoting time to schooling rather than to the labor market increases. Therefore, the parent will prefer to send the child to work and allocate more time towards labor market activities. In this scenario, the cash transfer helps to increase the allocation of time towards schooling. However, it is clear from these panels that under a subsidy cash transfer structure the household is willing to allocate a higher amount of time towards school time. In all panels of Figure (C.9), as child school ability increases, the parent starts investing in the child education and therefore allocate child time towards schooling. The cash transfer reinforces this situation by providing resource than cover the costs associated with attending school.

Figure (C.10) plots how the child allocation of time towards labor market activities changes, when the household receives a cash transfer. Panels (a) and (b) of Figure (C.10) (low marker ability scenario) show that under this conditions the child will not be sent to work in the labor market. As the endowment of labor marker ability starts to rise, a household will be more likely to send the child to work (panels (c) and (d)).

In panels (c) and (d) of Figure (C.10), when school ability is low, a subsidy cash transfer structure has a lower effect in 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 greater impact on mitigating child labor compared to the lump sum transfer.

Overall, when the child is endowed with market ability, both types of cash transfers reduce the amount of time that the child devotes to market work. When a child has low school ability and low market ability, the transfer is likely to generate a child idleness scenario. As the child's school ability increases, the child opportunity cost

of devoting his or her time to the labor market rather than to schooling increases. Consequently, the parent is less willing to allocate child time to the labor market and the child's labor supply falls. In a scenario with high market ability, the child opportunity cost of devoting his time to the labor market rather than to schooling is partially mitigated, and the parent will choose to allocate child time to the labor market and to schooling.

Figure (C.11) plots the effect of the cash transfer on the child time allocated to leisure. When there is low market ability (panels (a) and (b) of Figure (C.11)), both types of cash transfer structures decrease the allocation of time towards leisure. If the child's school ability is also low, the parent will chose idleness for the child. As school ability rises, there is an increase in the amount of hours devoted to school, implying a decrease in leisure time. The magnitude of the effect of the transfer in reducing leisure time is greater under a subsidy scenario. Both in the benchmark and full cases, the subsidy structure of the cash transfer provides a larger reduction in leisure, compared to the lump sum structure.

Comparing panels panels (c) and (d) of Figure (C.11), when the child is endowed with higher market ability, the subsidy cash transfer structure induces a beneficiary household to reduce the child allocation of time to leisure activities, while in the lump sum cash transfer structure, a household that receives the program increases the child allocation of time to leisure activities. These opposing reactions occur because under the lump sum transfer structure, the induced reduction of the program in the amount of time that a child devotes to work activities is translated into higher allocation of time to schooling and leisure. On the other hand, under a subsidy structure, the rise in the amount of time that the child allocates to schooling is compensated with a decrease in the amount of time assigned to the labor market and leisure.

In all the panels of Figure (C.11), as child school ability increases, there are important reductions in leisure time. This happens because the opportunity cost of devoting child time to the labor market or leisure, rather than to schooling, increases. Consequently, the parent is less willing to allocate child time to the labor market or to leisure and therefore the parent decides to devote more time of the child's time to schooling activities. The cash transfer contributes to this process as it eases the re-

source constraint of the household. However, the structure of the cash transfer makes the magnitudes and patterns of substitution to differ, leading to different compositions of time allocation.

3.5 Conclusion

In this paper, I studied how household decisions related to child activities respond when the household receives a cash transfer. Overall, these results suggest that the most prevalent behavioral shift caused by the program was a reduction in the probability that the household decide only sending the child to work, an increase in the probability that the household chooses concurrently work and school, and an increase in the likelihood that a household chooses schooling only for the child. Moreover, these effects are heterogeneous among boys and girls. Using an alternative construction of child activities that disaggregate child work into economic activities (paid and unpaid) and household chores shows that the program reduces the probability of sending the children only to work in economic activities (paid and unpaid) and increases the likelihood of choosing the option schooling and household chores. This shows the importance of accounting for different types of working activities when evaluating the well-being of children.

I further analyze the effect of the program on the allocation of time towards working activities and perform a decomposition to measure the effect of the program 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 do not affect the allocation of time to any work activity, paid employment and unpaid household services. The decomposition shows that these effects on hours are explained by the extensive margin effect. This suggests that children in beneficiary households do not work fewer hours conditional on participating in the activity, they are just less likely to be performing that activity.

Finally, I propose a simple theoretical framework of household decision making that highlights how cash transfers and child skills endowment determine parents' decisions on children's activities and time allocation. The model provides results that

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), child wages, school costs and child ability affect the optimal determination of household decisions related to schooling and work. Moreover, by modeling the cash transfer as a subsidy of the human capital input and as lump sum transfer, this study contributes to the discussion of whether cash transfers should be conditional (on school enrollment) or unconditional. Overall, these results emphasize the importance of governmental transfer programs on influencing the household decisions related to child activities and suggest a windfall of resources generate positive results in shifting the decisions of households toward more schooling for the children.

Table 3.1: Descriptive Statistics of Household Characteristics by Lottery Status

	Winners[a] (N=993)		Losers[b] (N=890)		Difference (N=1,883)
	Mean	SD	Mean	SD	$a - b$
Child Activities I (Any Work)					
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 that are used as dependent variables as well as a set of important characteristics of the households used in the analysis. *significant to 10%; **significant to 5%; ***significant to 1%.

Table 3.2: Descriptive Statistics of Household Characteristics by Lottery Status (Cont.)

	Winners[a] (N=993)		Losers[b] (N=890)		Difference (N=1,883)
	Mean	SD	Mean	SD	$a - b$
Household Characteristics					
Child Earnings	9.85	1.05	9.76	1.13	0.18
Non-Student	0.35	0.02	0.34	0.02	0.00
Age	13.43	0.05	13.45	0.05	-0.02
Male	0.47	0.02	0.52	0.02	-0.05**
Speaks Indigenous Language	0.10	0.01	0.08	0.01	0.02
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 variables that are used as dependent variables as well as a set of important characteristics of the households used in the analysis. *significant to 10%; **significant to 5%; ***significant to 1%.

Table 3.3: Estimates of the Impact of the CCT Program on Household Decisions over Child Activities (Using Any Work Activities)

	(1)		(2)		(3)		(4)	
	No School and No Work		Work and No School		Work and School		School and No Work	
CCT ITT	0.006	0.004	-0.063***	-0.070***	0.046*	0.052**	0.012	0.014
	(0.009)	(0.008)	(0.023)	(0.021)	(0.024)	(0.022)	(0.012)	(0.010)
CCT LATE	0.020	0.015	-0.204***	-0.227***	0.143*	0.164**	0.041	0.047
	(0.036)	(0.034)	(0.078)	(0.064)	(0.083)	(0.073)	(0.044)	(0.039)
Controls	×	✓	×	✓	×	✓	×	✓
N	1883	1883	1883	1883	1883	1883	1883	1883

Notes: The table shows the estimated marginal effect of being eligible for the CCT program (ITT) as well as receiving the CCT 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, indicator for rural area, indicator if head of household head was male and indicator if child speaks indigenous language. Standard errors in parenthesis are bootstrapped and clustered at the parish level with 1000 replications. *significant to 10%; **significant to 5%; ***significant to 1%.

Table 3.4: Estimates of the Impact of the CCT Program on Household Decisions over Boys and Girls Activities

	(1)		(2)		(3)		(4)	
	No School and No Work		Work and No School		Work and School		School and No Work	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
CCT								
ITT	0.011	-0.003	-0.065**	-0.075 **	0.020	0.076**	0.035*	0.002
	(0.017)	(0.015)	(0.028)	(0.030)	(0.030)	(0.030)	(0.019)	(0.014)
CCT								
LATE	0.036	-0.006	-0.198***	-0.261**	0.045	0.262**	0.117*	0.005
	(0.051)	(0.057)	(0.071)	(0.109)	(0.082)	(0.115)	(0.060)	(0.030)
Controls	✓	✓	✓	✓	✓	✓	✓	✓
N	925	958	925	958	925	958	925	958

Notes: The table shows the estimated marginal effect of being eligible for the CCT program (ITT) as well as receiving the CCT program (LATE) on the household decision related to boys and girls 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, indicator for rural area, indicator if head of household head was male and indicator if child speaks indigenous language. Standard errors in parenthesis are bootstrapped and clustered at the parish level with 1000 replications. *significant to 10%; **significant to 5%; ***significant to 1%.

Table 3.5: Estimates of the Impact of the CCT Program on Household Decisions over Child Activities (Extended)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	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
CCT								
ITT	0.004	-0.032***	-0.012	-0.024	0.003	0.069***	-0.021	0.012
	(0.011)	(0.012)	(0.012)	(0.018)	(0.011)	(0.020)	(0.019)	(0.010)
CCT								
LATE	0.017	-0.102**	-0.040	-0.084	0.014	0.217***	-0.067	0.046
	(0.032)	(0.044)	(0.041)	(0.055)	(0.032)	(0.064)	(0.065)	(0.035)
Controls	✓	✓	✓	✓	✓	✓	✓	✓
N	1883	1883	1883	1883	1883	1883	1883	1883

Notes: The table shows the estimated marginal effect of being eligible for the CCT program (ITT) as well as receiving the CCT 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, indicator for rural area, indicator if head of household head was male and indicator if child speaks indigenous language. Standard errors in parenthesis are bootstrapped and clustered at the parish level with 1000 replications. *significant to 10%; **significant to 5%; ***significant to 1%.

Table 3.6: Treatment Effects on Labor Market Outcomes at Extensive and Intensive Margins

	(1)	(2)	(3)	(4)	(5)
	Any Work Activity	Economic Activity	Paid Employment	Unpaid HH Services	Unpaid Economic Activity
Total effect	-0.11*	-0.26***	-0.072	0.044	-0.21***
	(0.062)	(0.091)	(0.066)	(0.056)	(0.074)
Extensive margin	-0.078*	-0.28***	-0.081	0.0068	-0.22***
	(0.045)	(0.087)	(0.064)	(0.052)	(0.070)
Intensive margin	-0.030	0.021	0.0083	0.037	0.019
	(0.038)	(0.026)	(0.013)	(0.038)	(0.018)
Treatment effect conditional	-0.033	0.038	0.047	0.046	0.046
on participating in activity	(0.042)	(0.048)	(0.077)	(0.047)	(0.043)
Controls	✓	✓	✓	✓	✓
N	1883	1883	1883	1883	1883

Notes: The table shows the decompositions of the intention to treat effects on hours allocated different activities into extensive and intensive margin effects. The extensive margin effects are the intention to treat effects on hours due to the treatment effect on working, evaluated at the mean hours for the control group. The intensive margin effects are the differences between the intention to treat effects and extensive margin effects, which must be due to changes in hours for the employed children in the treatment group. The conditional effect is the implied mean change in hours per working treatment group children. Standard errors in parenthesis are bootstrapped and clustered at the parish level with 1000 replications. *significant to 10%; **significant to 5%; ***significant to 1%.

Table 3.7: Local Average Treatment Effects on Labor Market Outcomes at Extensive and Intensive Margins

	(1)	(2)	(3)	(4)	(5)
	Any Work Activity	Economic Activity	Paid Employment	Unpaid HH Services	Unpaid Economic Activity
Total effect	-0.36	-0.84**	-0.24	0.14	-0.67***
	(0.217)	(0.332)	(0.234)	(0.189)	(0.252)
Extensive margin	-0.26*	-0.91***	-0.26	0.023	-0.74***
	(0.154)	(0.308)	(0.226)	(0.171)	(0.237)
Intensive margin	-0.099	0.069	0.026	0.12	0.062
	(0.135)	(0.087)	(0.046)	(0.117)	(0.060)
Treatment effect conditional	-0.11	0.12	0.15	0.15	0.15
on participating in activity	(0.149)	(0.167)	(0.263)	(0.145)	(0.146)
Controls	✓	✓	✓	✓	✓
N	1883	1883	1883	1883	1883

Notes: The table shows the decompositions of the local average treatment effects on hours allocated different activities into extensive and intensive margin effects. The extensive margin effects are the intention to treat effects on hours due to the treatment effect on working, evaluated at the mean hours for the control group. The intensive margin effects are the differences between the intention to treat effects and extensive margin effects, which must be due to changes in hours for the employed children in the treatment group. The conditional effect is the implied mean change in hours per working treatment group children. Standard errors in parenthesis are bootstrapped and clustered at the parish level with 1000 replications. *significant to 10%; **significant to 5%; ***significant to 1%.

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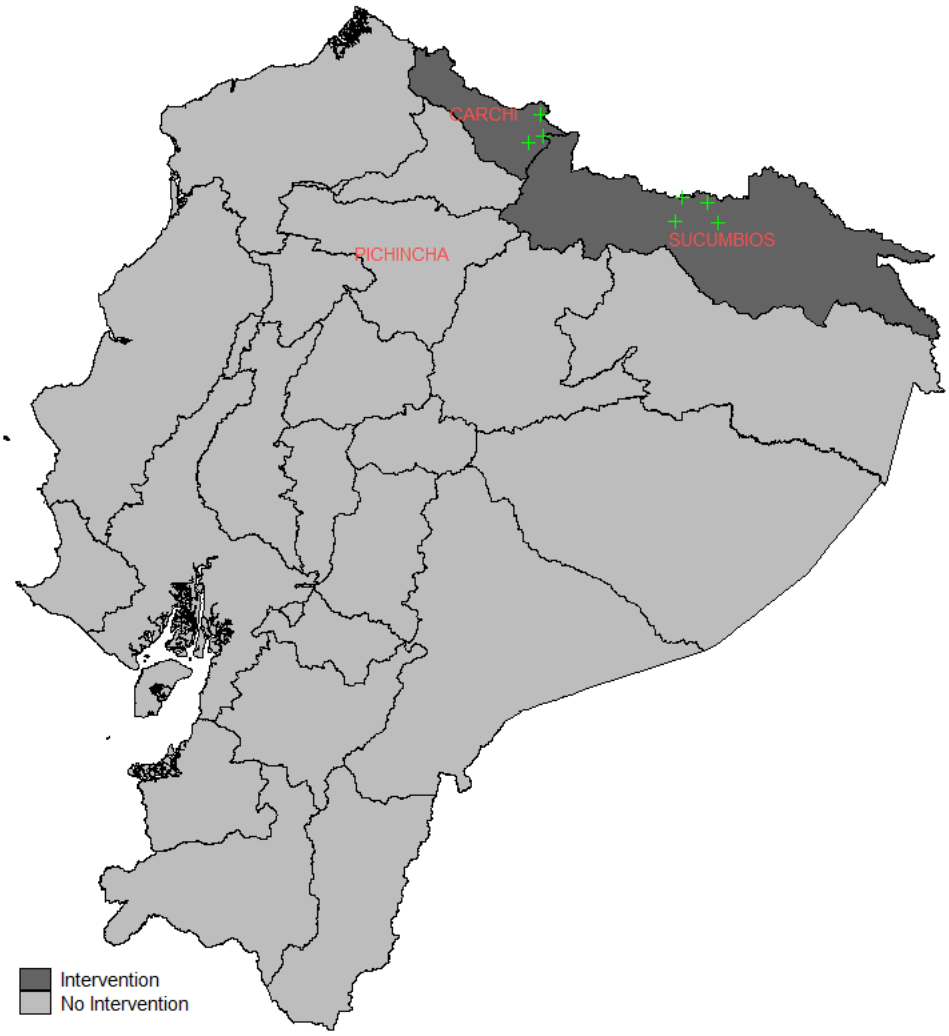
Appendix A

Appendix of Intra-Household Allocations and Consumption Inequality under Cash Transfers and Violence

A.1 Descriptive Tables and Plots

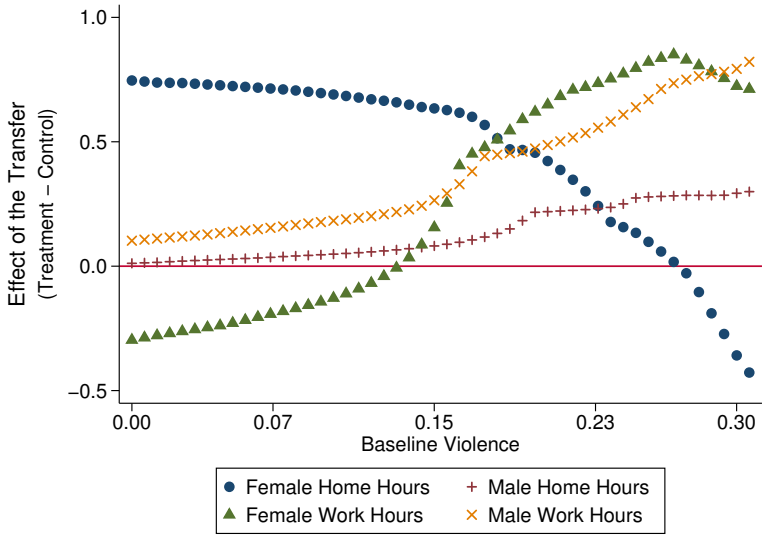
Figure A.1: Map of Intervention Provinces



Notes: The map shows the provinces and locations within the provinces where the program was implemented.

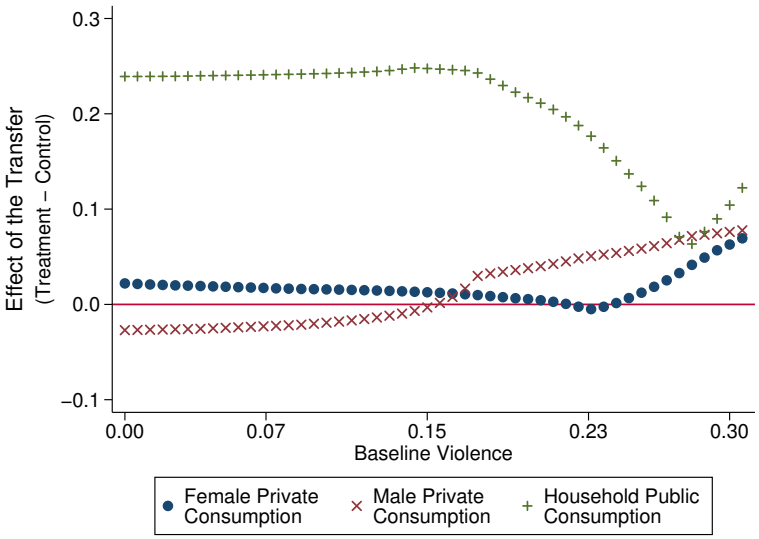
A.2 Reduced Form Estimates of Household Allocation Decisions

Figure A.2: Adult Time Allocation



Notes: The figure illustrates how the program influences the allocation of hours of adult household members at follow-up. These calculations come from the reduced form estimation that compare treated versus control households at different levels of baseline violence. The treatment effects are measured in hours per day.

Figure A.3: Monthly Consumption (Dollars per month/100)



Notes: The figure illustrates how the program influences consumption at follow-up. These calculations come from the reduced form estimation that compare treated versus control households at different levels of baseline violence. The treatment effects are measured in dollars.

Table A.1: Decomposition of Time Allocation and Violence into Extensive and Intensive Margins

	(1)	(2)	(3)	(4)	(5)
	Housework	Labor Market	Housework	Labor Market	Violence
	Women		Men		Household
Total Effect	0.699***	0.006	-0.047	0.130	-0.057***
	(0.254)	(0.401)	(0.081)	(0.170)	(0.020)
Extensive Margin	0.065	-0.239	0.133**	0.080	-0.031**
	(0.045)	(0.310)	(0.059)	(0.065)	(0.013)
Intensive Margin	0.633**	0.245	-0.086	0.049	-0.026
	(0.248)	(0.576)	(0.065)	(0.153)	(0.016)
Treatment Effect	0.640**	0.691	-0.146	0.051	-0.067*
Conditional on Decision	(0.251)	(1.622)	(0.110)	(0.159)	(0.040)
Control Group Mean	5.806	5.181	1.817	6.789	0.245
Clusters	145	145	145	145	145
N	1235	1235	1235	1235	1235

Notes: This table reports decomposition of treatment effects of the cash transfer program into extensive and intensive margins. Standard errors in parentheses are clustered at the cluster level. *significant at 10%; **significant at 5%; ***significant at 1%.

A.3 Additional Estimation Results

Table A.2: Structural Estimation Results

	(1)		(2)	
Parameter	Coefficient	S.E.	Coefficient	S.E.
Preference Parameters				
$\alpha_{10}^{♂}$	0.784***	(0.031)	0.797***	(0.029)
$\alpha_{11}^{♂}\left[age^{♂}/10\right]$	-0.018**	(0.007)	-0.006	(0.007)
$\alpha_{2}^{♂}\left[\bar{u}^{Q}\right]$	-1.369***	(0.058)	-1.553***	(0.054)
$\beta^{♂}$	0.120***	(0.013)	0.130***	(0.014)
$\alpha_{10}^{♀}$	0.735**	(0.031)	0.787***	(0.029)
$\alpha_{11}^{♀}\left[age^{♀}/10\right]$	-0.010	(0.007)	0.006	(0.007)
$\alpha_{2}^{♀}\left[\bar{u}^{Q}\right]$	-1.672***	(0.078)	-1.670***	(0.075)
$\beta^{♀}$	0.100***	(0.023)	0.112***	(0.024)
Home Production Parameters				
κ	-0.379**	(0.125)	-0.703***	(0.114)
γ_1	0.260***	(0.009)	0.260***	(0.011)
γ_2	0.449***	(0.015)	0.400***	(0.014)
γ_3	0.291***	(0.010)	0.340***	(0.011)
ϵ_0^Q	0.022***	(0.000)	0.032***	(0.000)
ϵ_1^Q[children]	0.063***	(0.000)	0.003***	(0.000)
ϵ_2^Q[mean children age]	-0.013***	(0.000)	-0.007***	(0.000)
ϵ_3^Q[violence]	0.032***	(0.000)	-0.003***	(0.001)
Bargaining Power Parameters				
Λ_1	-1.176***	(0.092)	-1.150***	(0.089)
$\Lambda_2\left[w^{♂}/w^{♀}\right]$	1.000***	(0.041)	1.100***	(0.036)
$\Lambda_3\left[y\right]$	0.037***	(0.010)	0.059***	(0.014)
$\Lambda_4\left[age^{♂}-age^{♀}/10\right]$	0.336**	(0.162)	0.153	(0.324)

Table A.3: Structural Estimation Results (Cont.)

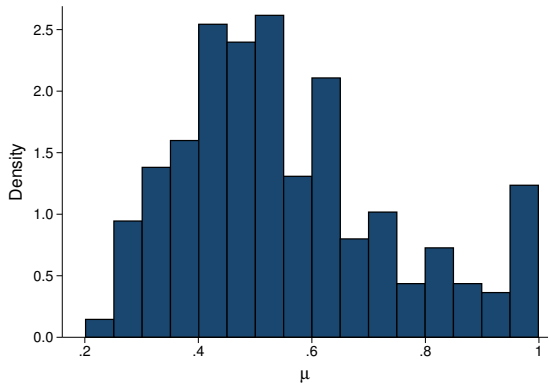
	(1)		(2)	
Parameter	Coefficient	S.E.	Coefficient	S.E.
Λ_5[violence]	1.063***	(0.115)	-0.122	(0.076)
Λ_6[prob. of receiving transfer]	-0.100*	(0.051)	-0.100**	(0.043)
Λ_7[husband's share of HH assets]	0.000***	(0.000)	0.000	(0.001)
Violence Parameters				
δ_1	–	–	0.100***	(0.034)
δ_2[probability of receiving transfer]	–	–	-0.038*	(0.019)
δ_3[baseline violence]	–	–	0.400***	(0.061)
δ_4[violence in neighborhood]	–	–	0.000	(0.011)
$\delta_5 \left[w^{\male}/w^{\female}\right]$	–	–	0.025***	(0.005)
δ_6 [y]	–	–	-0.035***	(0.003)

Notes: The table shows the estimated parameters obtained by the Feasible Generalized Non Linear Least Squares (FGNLS) estimator using the data from the random control trail transfer program. The expressions in brackets refer to the objects that are related to the respective parameters. Standard errors in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%

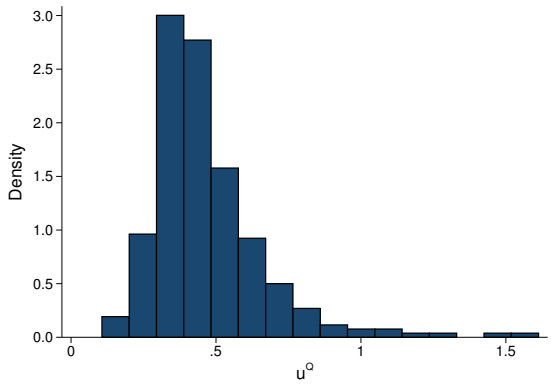
A.4 Summary Statistics of Predicted Variables

Figure A.4: Predicted Distributions

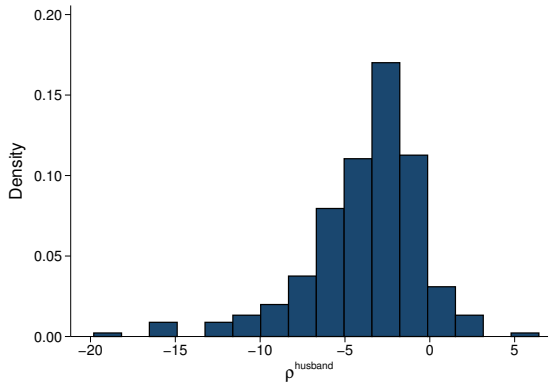
(a) Pareto Weight



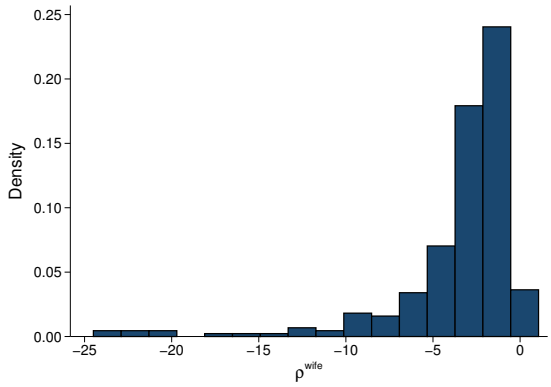
(b) Level of Home Good



(c) Husband Conditional Sharing Rule ($\rho^{♂}$)



(d) Wife Conditional Sharing Rule ($\rho^{♀}$)



Notes: The left panels depicts the distribution of the predicted Pareto weight, level of home good and the conditional sharing rules provided by the structural model.

Table A.4: Summary Statistics

	mean	s.d	min	max	median
μ	0.56	0.19	0.20	0.99	0.52
$\rho^{\male}$	-3.79	3.40	-19.81	6.43	-3.09
$\rho^{\female}$	-3.50	3.88	-24.94	1.06	-2.36
$\bar{u}^{Q}$	0.47	0.20	0.11	1.61	0.43

Notes: The table show the summary statistics of the predictions from the fitted structural model.

A.5 Patterns of Specialization

A.5.1 Labor Supply Elasticities

Table A.5: Labor Supply Elasticities

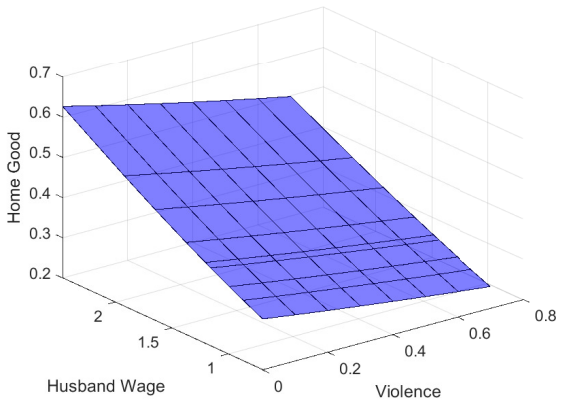
	Husband [♂]	Wife [♀]
Own wage elasticity	0.57	0.77
Partners wage elasticity	0.17	-1.07
Non-labor income elasticity	0.11	0.26

Notes: The table show the labor supply elasticities computed numerically for the sample median.

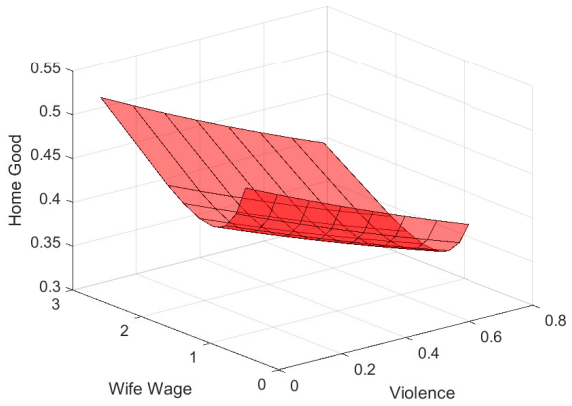
A.5.2 Effect of Violence on Home Good

Figure A.5: Effect of Violence on Home Good Production

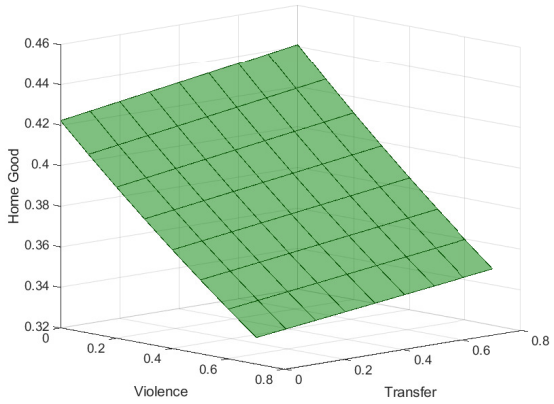
(a) Violence and Husband's Wage



(b) Violence and Wife's Wage



(c) Violence and Transfer



Notes: The figure shows how different levels of intra-household violence affect the home good production.

A.6 Marginal Willingness to Pay by Type of Household

Table A.6: Husband and Wife Marginal Willingness to Pay (MWP) using Alternative Specification

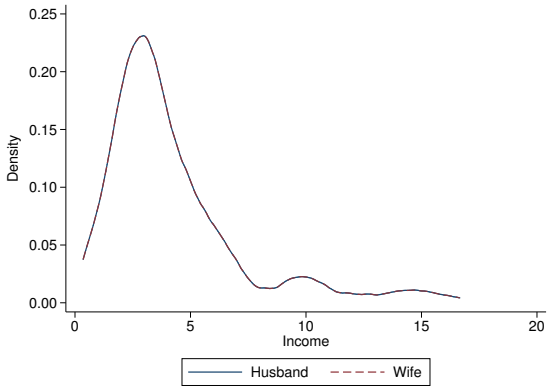
	$MWP^{\male}$	$MWP^{\female}$	Difference [p-value]
Overall			
	0.579	0.420	0.158***
	(0.012)	(0.012)	[0.000]
No Transfer and No Violence			
	0.561	0.438	0.122***
	(0.038)	(0.038)	[0.000]
Transfer and No Violence			
	0.564	0.435	0.130***
	(0.021)	(0.021)	[0.000]
No Transfer and Violence			
	0.600	0.400	0.200***
	(0.032)	(0.032)	[0.000]
Transfer and Violence			
	0.589	0.411	0.179***
	(0.021)	(0.021)	[0.000]

Notes: The table presents the average marginal willingness to pay for the public good for each member of the couple as well as the difference between husband and wife. Standard errors in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%.

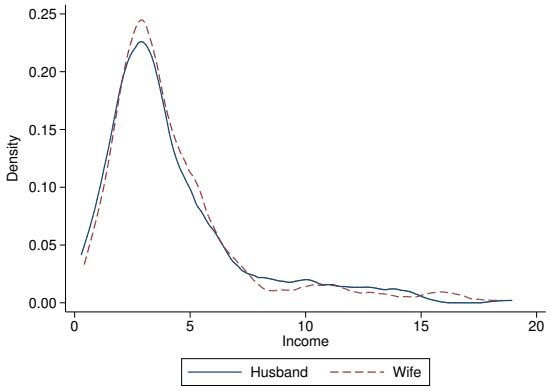
A.7 Distribution of Income (Different Measures)

Figure A.6: Distribution of Income

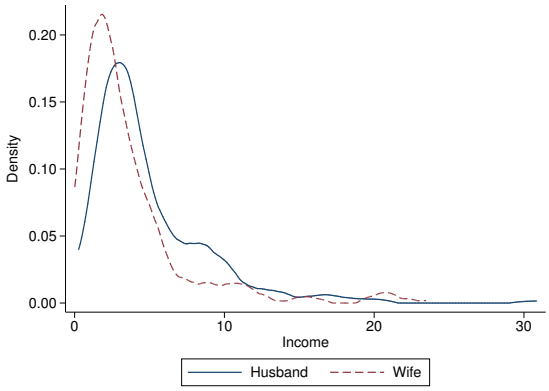
(a) Indifference Scales



(b) A la Barten (Equal Prices)



(c) Individual Prices (Individual MWP)



Notes: The figure shows the distribution of the income for husbands and wives using the different types of measures.

A.8 Poverty Measures by Type of Household

Table A.7: Individual Poverty by Household Type using Alternative Specification

	Equivalence scales	Equal prices	Individual prices
Overall			
Global	0.463	0.471	0.525
Husband [♂]	0.463	0.445	0.402
Wife [♀]	0.463	0.496	0.648
Difference	–	0.050	0.246***

Notes: This table shows the incidence of poverty at the individual level disaggregated by the types of households. These indicators are constructed using the definitions on Equation (1.35) and the model estimates obtained from the structural model. An individual is characterized as poor if her/his income share falls below the individual poverty line.

Table A.8: Individual Poverty by Household Type using Alternative Specification (Cont.)

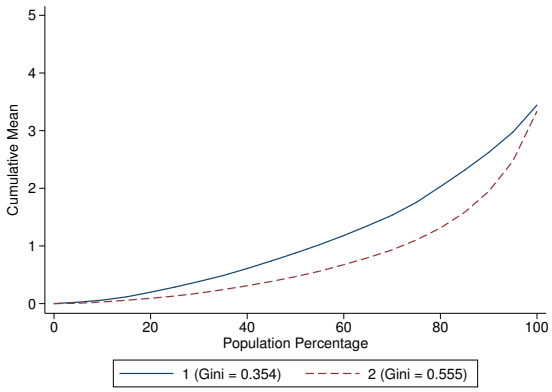
	Equivalence scales	Equal prices	Individual prices
No Transfer and No Violence			
Global	0.517	0.517	0.569
Husband [♂]	0.517	0.517	0.448
Wife [♀]	0.517	0.517	0.690
Difference	–	–	0.241*
Transfer and No Violence			
Global	0.397	0.408	0.520
Husband [♂]	0.397	0.387	0.448
Wife [♀]	0.397	0.428	0.591
Difference	–	0.041	0.143**
No Transfer and Violence			
Global	0.465	0.453	0.500
Husband [♂]	0.465	0.442	0.349
Wife [♀]	0.465	0.465	0.651
Difference	–	0.023	0.302***
Transfer and Violence			
Global	0.509	0.523	0.528
Husband [♂]	0.509	0.481	0.368
Wife [♀]	0.509	0.566	0.689
Difference	–	0.085	0.321***

Notes: This table shows the incidence of poverty at the individual level disaggregated by the types of households. These indicators are constructed using the definitions on Equation (1.35) and the model estimates obtained from the structural model. An individual is characterized as poor if her/his income share falls below the individual poverty line.

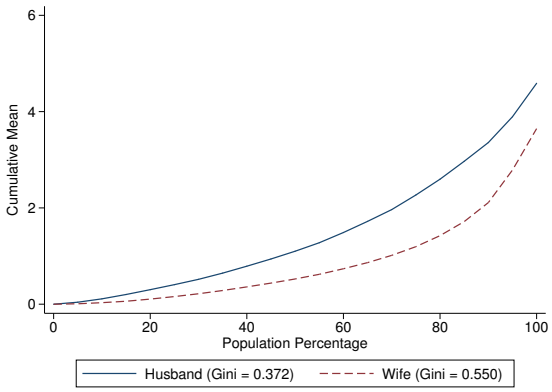
A.9 Inequality

Figure A.7: Generalized Lorenz Curves by Household Type

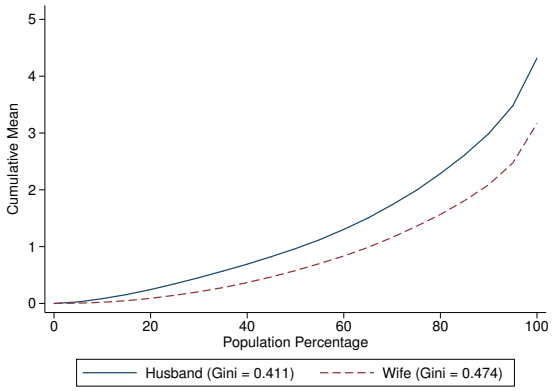
(a) No Transfer and No Violence



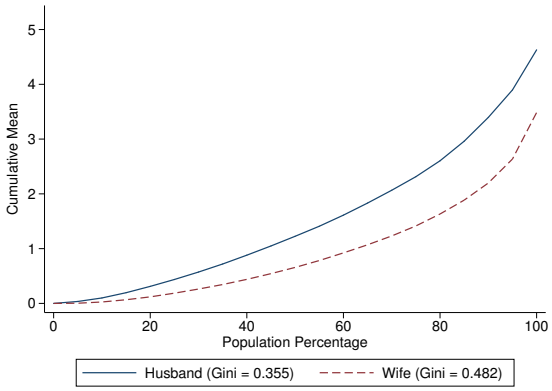
(b) No Transfer and Violence



(c) Transfer and No Violence



(d) Transfer and Violence



Notes: The figure shows the distribution of the marginal willingness to pay for husbands and wives.

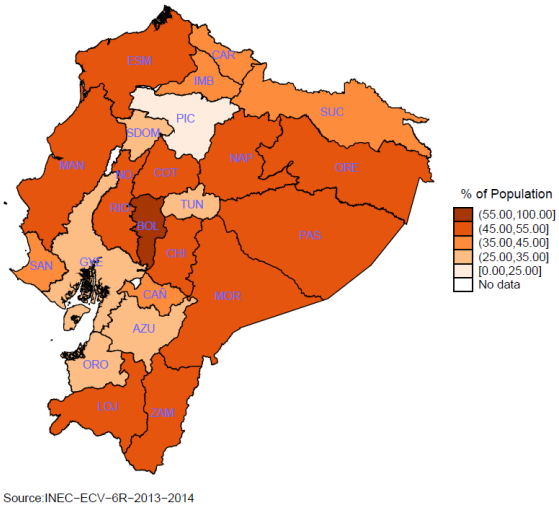
Appendix B

Appendix of Conditional Cash Transfers, Household Time Allocation and Bargaining Power: The Human Development Bonus in Ecuador

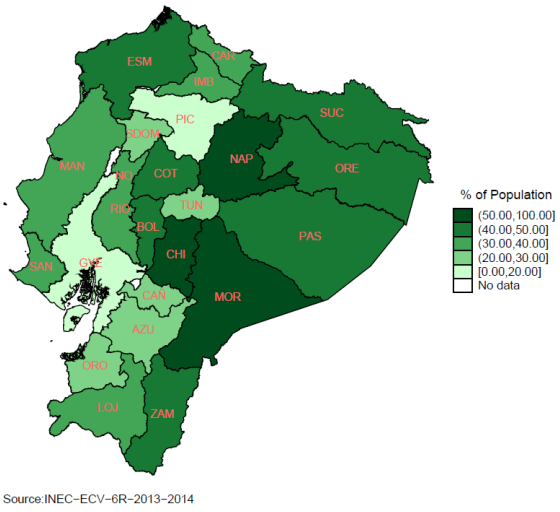
B.1 Descriptive Plots

Figure B.1: BDH and Poverty

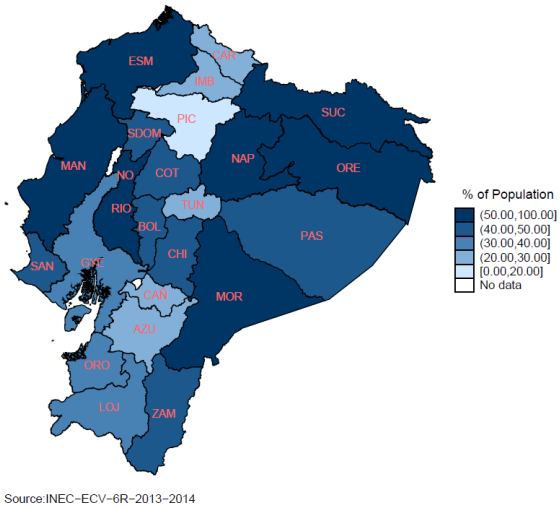
(a) BDH Beneficiaries



(b) Consumption Poverty



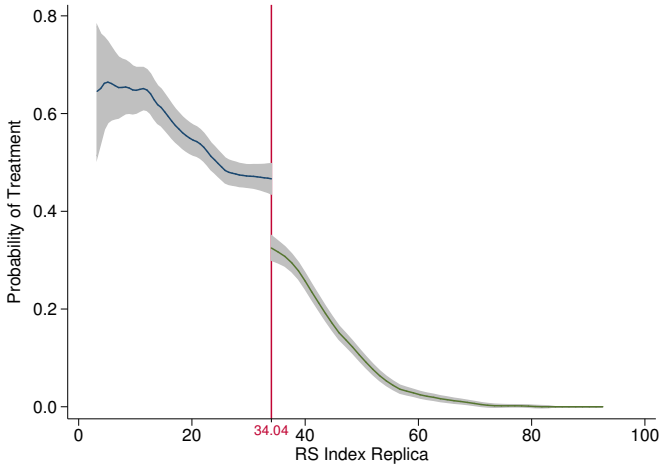
(c) NBI Poverty



Notes: The plot shows the geographic distribution of the conditional cash transfer beneficiaries as well as the poverty rates measured via consumption and unsatisfied basic needs.

B.2 Discontinuity on the Probability of Treatment

Figure B.2: Discontinuity in Probability of Treatment at Cutoff 34.04



Notes: The plot shows the existence of a discontinuity in the probability of treatment. Specifically, there is a decrease of approximately 10% in the probability treatment, at the discontinuity cutoff 34.04, given a local polynomial smoothed fit of the RS Index Replica score.

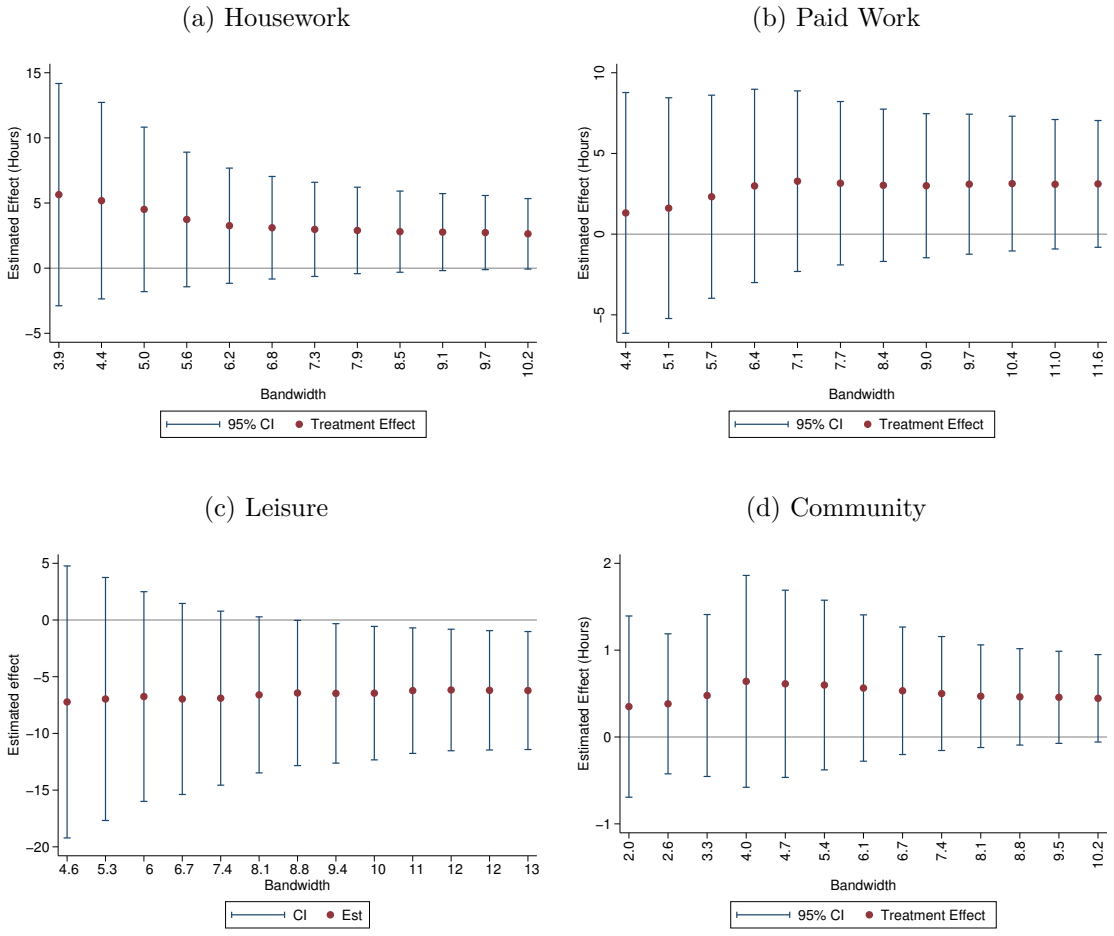
Table B.1: BDH Household Compliance

	RSII Index Score (Z)		
	$\leq$ 34.04	>34.04	
	(1)	(0)	Total
Treatment Status (T)			
Non-beneficiaries (0)	1,183	6,664	7,847
	15.08%	84.92%	100%
	46.05%	89.86%	78.59%
Beneficiaries (1)	1,386	752	2,138
	64.83%	35.17%	100%
	53.95%	10.14%	21.41%
Total	2,569	7,416	9,985
	25.73%	74.27%	100%
	100%	100%	100%

Notes: The table shows a cross-tabulation of the treatment status of households and its eligibility status based in the RSII index. 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) = 53.95%-10.14%=43.81%

B.3 Time Allocation Decisions

Figure B.3: Estimates of the Impact of the BDH Program over Women's Allocation of Time for Different Bandwidths



Notes: The plot shows fuzzy regression discontinuity LATE point estimations and confidence intervals over a range of bandwidths. Bootstrap confidence intervals based on 200 replications.

Table B.2: Robust Estimates of the Impact of the BDH Program over Women's Allocation of Time

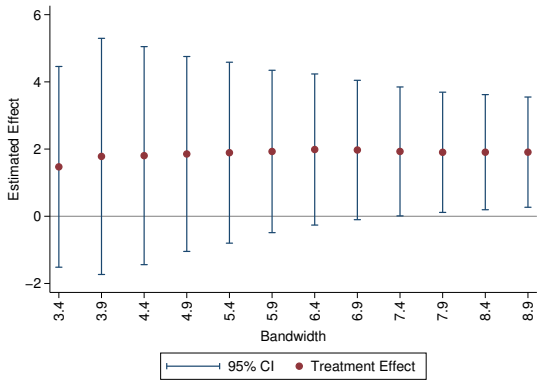
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Housework Hours	Housework Hours	Paid Work Hours	Paid Work Hours	Leisure Hours	Leisure Hours	Community Hours	Community Hours
BDH								
Conventional	2.165**	2.632**	3.142*	3.376	-5.432***	-6.034***	0.461***	0.542**
	(1.080)	(1.307)	(1.719)	(2.085)	(1.800)	(2.200)	(0.173)	(0.273)
Bias-corrected	2.358**	2.832**	3.823**	3.069	-6.751***	-5.944***	0.572***	0.593**
	(1.080)	(1.307)	(1.719)	(2.085)	(1.800)	(2.200)	(0.173)	(0.273)
Robust	2.358**	2.832*	3.823*	3.069	-6.751***	-5.944**	0.572***	0.593*
	(1.185)	(1.475)	(1.956)	(2.321)	(1.989)	(2.480)	(0.190)	(0.311)
Polynomial Terms	Linear	Quadratic	Linear	Quadratic	Linear	Quadratic	Linear	Quadratic
Controls	✓	✓	✓	✓	✓	✓	✓	✓
N	9,985	9,985	9,985	9,985	9,985	9,985	9,985	9,985
Effective N	4,661	5,483	4,158	5,776	4,704	3,937	4,389	4,178

Notes: The table shows the estimated effect of being eligible for the BDH cash transfer program on time allocation to housework, paid work, leisure and community activities for women an men head or spouse within the household. Columns (1), (3), (5) and (7) include polynomials of grade 1 (Linear) and columns: (2), (4), (6), (8), include polynomials of grade 2 (Quadratic) of the running variable (eligibility score index). The treatment effects are measured in hours per day and each come from a fuzzy regression discontinuity using the methodology proposed by Calonico, Cattaneo and Titiunik 2014*a* and Calonico et al. 2018. Clustered standard errors at the village level in parentheses. *significant to 10%; **significant to 5%; ***significant to 1%.

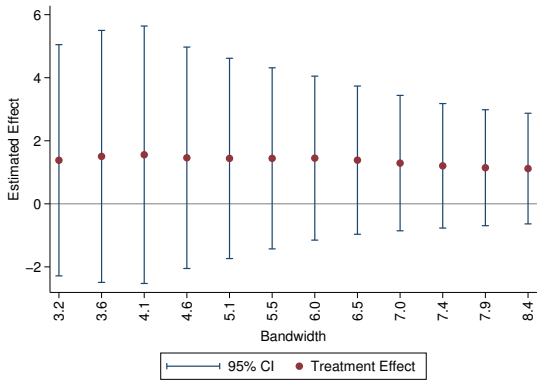
B.4 Bargaining Power Results

Figure B.4: Estimates of the Impact of the BDH Program over Women's Decision Making (NLPCA) for Different Bandwidths

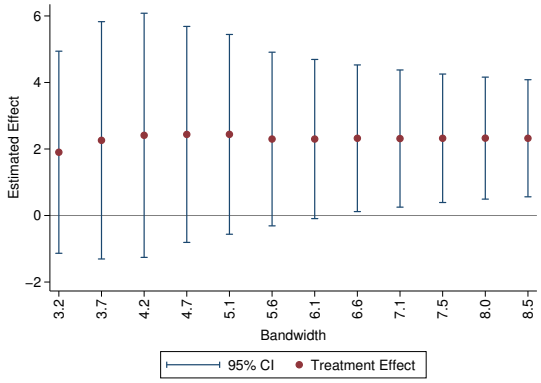
(a) Overall Decisions Index



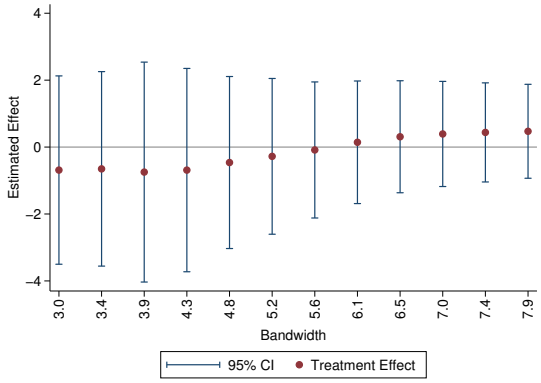
(b) Working Activities Decision Index



(c) Home and Personal Activities Decision Index



(d) Purchases Decision Index



Notes: The plot shows fuzzy regression discontinuity LATE point estimations and confidence intervals over a range of bandwidths. Bootstrap confidence intervals based on 200 replications.

Table B.3: IV Estimates of the Impact of the BDH Program on Women's Decision Making (Composite Index)

	(1)	(2)	(3)	(4)
	Overall	Working Decisions	Home and Personal Activities Decisions	Purchases Decisions
1st Stage Discontinuity	0.117***	0.117***	0.117***	0.117***
	(0.031)	(0.031)	(0.031)	(0.031)
BDH	1.206**	0.508	1.695***	0.403
	(0.594)	(0.624)	(0.574)	(0.576)
Polynomial Terms	Linear	Linear	Linear	Linear
Controls	✓	✓	✓	✓
N	3369	3369	3369	3369

Notes: The table shows the estimated effect of being eligible for the BDH cash transfer program on the overall women's decision making index as well as on the decision making index related to working activities, home and personal activities and purchases. Each index was constructed a composite measure that give 1 point for each time the Woman indicates having sole or sole/joint decision-making power across all applicable domains. The treatment effects are measured in standard deviations of the decision making index and each come from IV regression. Clustered standard errors at the village level in parentheses. *significant to 10%; **significant to 5%; ***significant to 1%.

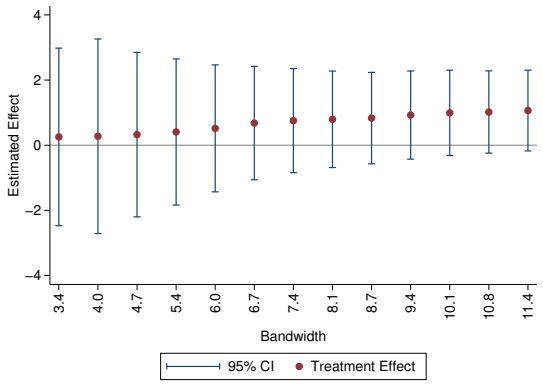
Table B.4: Robust Estimates of the Impact of the BDH Program on Women's Decision Making (Composite Index)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Overall	Overall	Working Decisions	Working Decisions	Home Decisions	Home Decisions	Purchases Decisions	Purchases Decisions
BDH								
Conventional	1.207*	0.645	0.392	-0.160	1.762***	1.966**	0.318	-0.857
	(0.630)	(0.842)	(0.657)	(1.077)	(0.615)	(0.768)	(0.620)	(1.093)
Bias-corrected	1.357**	0.352	0.533	-0.499	1.948***	1.905**	0.0884	-1.224
	(0.630)	(0.842)	(0.657)	(1.077)	(0.615)	(0.768)	(0.620)	(1.093)
Robust	1.357*	0.352	0.533	-0.499	1.948***	1.905**	0.0884	-1.224
	(0.757)	(0.964)	(0.778)	(1.218)	(0.728)	(0.867)	(0.733)	(1.231)
Polynomial Terms	Linear	Quadratic	Linear	Quadratic	Linear	Quadratic	Linear	Quadratic
Controls	✓	✓	✓	✓	✓	✓	✓	✓
N	9985	9985	9985	9985	9985	9985	9985	9985

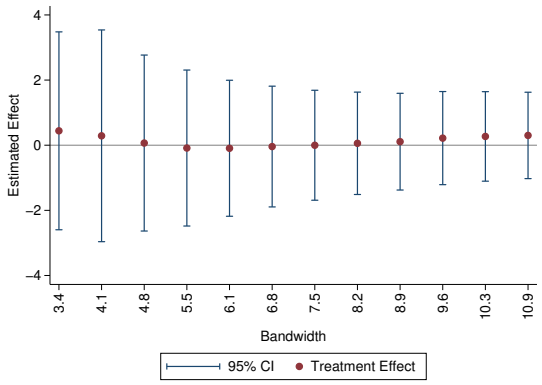
Notes: The table shows the estimated effect of being eligible for the BDH cash transfer program on the overall women's decision making index as well as on the decision making index related to working activities, home and personal activities and purchases. The treatment effects are measured in standard deviations of the decision making index and each come from a fuzzy regression discontinuity using the methodology proposed by Calonico, Cattaneo and Titiunik 2014*a* and Calonico et al. 2018. Clustered standard errors at the village level in parentheses. *significant to 10%; **significant to 5%; ***significant to 1%.

Figure B.5: Estimates of the Impact of the BDH Program over Women's Decision Making (Composite Index) for Different Bandwidths

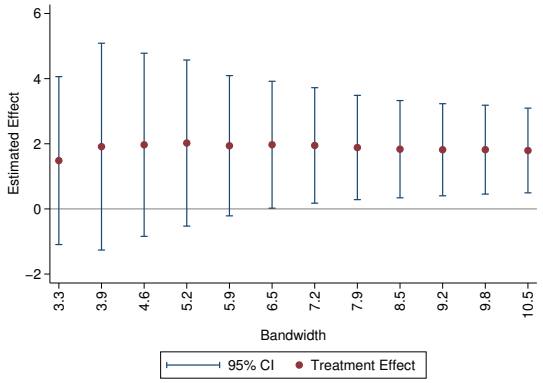
(a) Overall Decisions Index



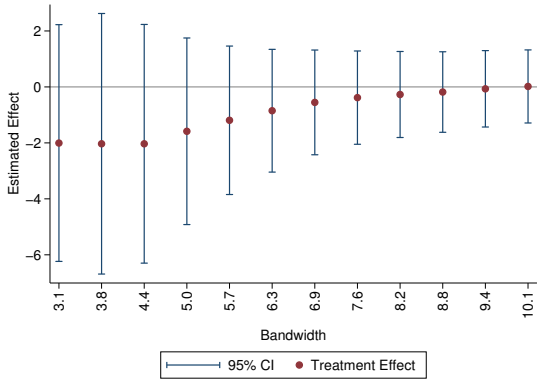
(b) Working Activities Decision Index



(c) Home and Personal Activities Decision Index



(d) Purchases Decision Index



Notes: The plot shows fuzzy regression discontinuity LATE point estimations and confidence intervals over a range of bandwidths. Bootstrap confidence intervals based on 200 replications.

Appendix C

Appendix of Child Labor, Schooling and Idleness in the Presence of Cash Transfers

C.1 Descriptive Tables and Plots

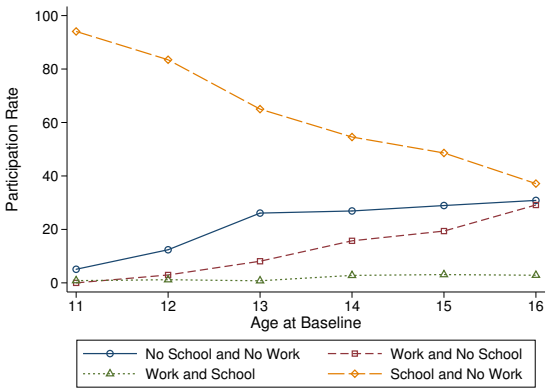
Table C.1: Compliance with the Program Assignment

	Lottery (Z)		
	Lose	Won	
	(0)	(1)	Total
Treatment Status (T)			
Non-beneficiaries (0)	550	310	860
	63.95%	36.05%	100%
	61.80%	31.22%	45.67%
Beneficiaries (1)	340	683	1,023
	33.24%	66.76%	100%
	38.20%	68.78%	54.33%
Total	890	993	1,883
	47.27%	52.73%	100%
	100%	100%	100%

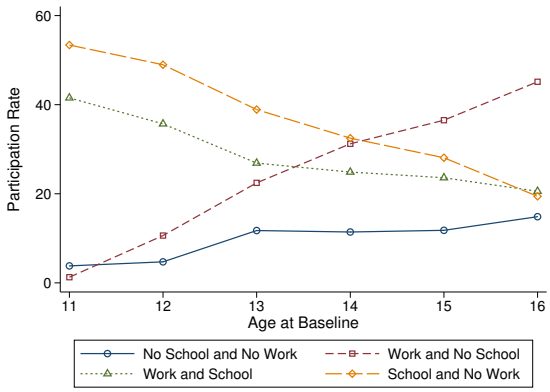
Notes: The table shows a cross-tabulation of the treatment status of households and if won or not the lottery. From the table it is possible to calculate the percentage of compliers in the sample by computing: (T=1/Z=1) - (T=1/Z=0) = 68.78%-38.2%=30.58%

Figure C.1: Participation Rate of the Different Child Activities

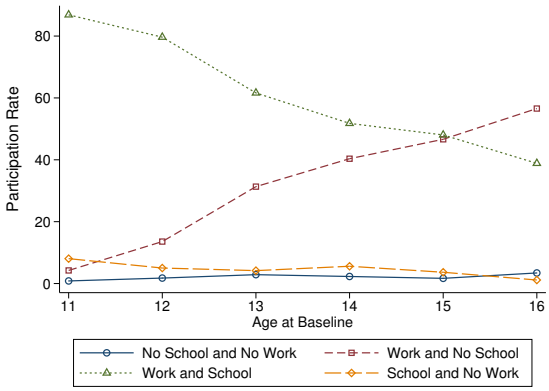
(a) Using Paid Work Employment



(b) Using Economic Activities

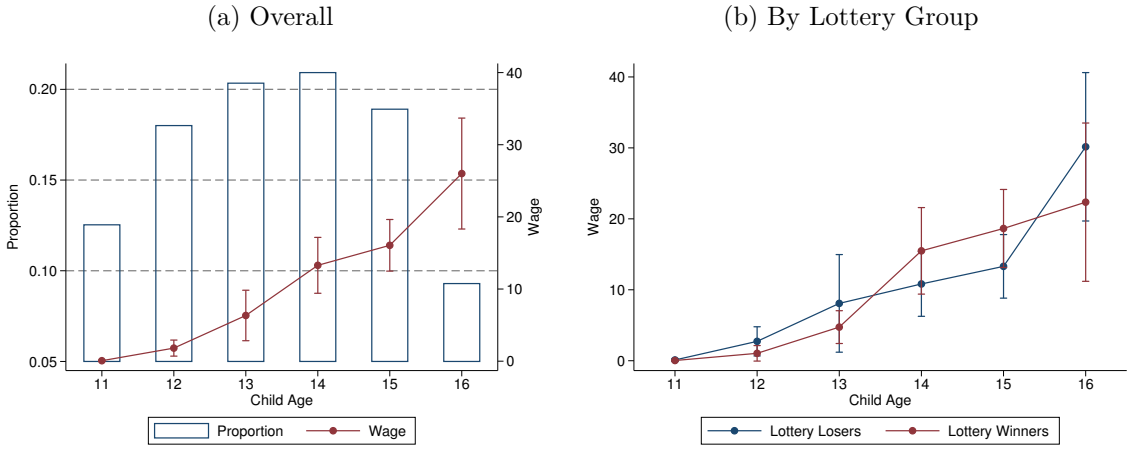


(c) Using Any Work Activities



Notes: The figure illustrates the participation rate in each child activity at baseline over different ages (11-16 years old) measured at baseline.

Figure C.2: Average Wage over Age Profile



Notes: The figure illustrates the average wage of children at different ages as well as the proportion of children in that have that age (measured at baseline).

C.2 LATE Decomposition into Intensive and Extensive Margins

Follow a similar procedure as the one used in Equation 3.6, it is possible to decompose a local average treatment effect (LATE) into its extensive and intensive margin. We know that LATE is defined as:

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

We can express the numerator as:

$$\underbrace{\mathbb{E}\left[Hours \mid Z=1\right]-\mathbb{E}\left[Hours \mid Z=0\right]}_{ITT\ for\ hours}$$

$$=\underbrace{\left(\mathbb{E}\left[Hours \mid Z=1, W=1\right]-\mathbb{E}\left[Hours \mid Z=0, W=1\right]\right)}_{ITT\ for\ hours \mid employment}\cdot\underbrace{Pr\left[Work=1 \mid Z=1\right]}_{Lottery\ winners\ emp.\ rate}$$

$$+\underbrace{\mathbb{E}\left[Hours \mid Z=0, W=1\right]}_{Lottery\ losers\ earnings \mid employment}\cdot\underbrace{\left(Pr\left[W=1 \mid Z=1\right]-Pr\left[W=1 \mid Z=0\right]\right)}_{ITT\ for\ employment}$$

Then we can rewrite the LATE as:

$$\underbrace{\frac{\mathbb{E}\left[Hours \mid Z=1\right]-\mathbb{E}\left[Hours \mid Z=0\right]}{\mathbb{E}\left[T \mid Z=1\right]-\mathbb{E}\left[T \mid Z=0\right]}}_{LATE\ for\ hours}$$

$$=\underbrace{\left(\frac{\mathbb{E}\left[Hours \mid Z=1,W=1\right]-\mathbb{E}\left[Hours \mid Z=0,W=1\right]}{\mathbb{E}\left[T \mid Z=1\right]-\mathbb{E}\left[T \mid Z=0\right]}\right)}_{LATE\ for\ hours \mid employment} \cdot \underbrace{Pr\left[W=1 \mid Z=1\right]}_{Lottery\ winners\ emp.\ rate}$$

$$+\ \underbrace{\mathbb{E}\left[Hours \mid Z=0,W=1\right]}_{Lottery\ losers\ earnings \mid employment} \cdot \underbrace{\left(\frac{Pr\left[W=1 \mid Z=1\right]-Pr\left[W=1 \mid Z=0\right]}{\mathbb{E}\left[T \mid Z=1\right]-\mathbb{E}\left[T \mid Z=0\right]}\right)}_{LATE\ for\ employment}$$

The first line on the right-hand side of this equation is the intensive margin effect whereas the the second line is 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 using this equation. I construct a program that implements this computation estimating all quantities as a system and bootstrapping the standard errors for inference purposes.

Table C.2: Multinational Probit Model of Household Decisions over Child Activities (Using Any Work Activities)

	(1)		(2)		(3)		(4)	
	No School and No Work		Work and No School		Work and School		School and No Work	
CCT ITT	0.234	0.231	Base	Base	0.284***	0.315***	0.373**	0.451*
	(0.143)	(0.151)			(0.096)	(0.096)	(0.167)	(0.159)
CCT LATE	0.778*	0.788	Base	Base	0.919***	1.018***	1.265**	1.508**
	(0.466)	(0.554)			(0.348)	(0.368)	(0.596)	(0.612)
Controls	×	✓	×	✓	×	✓	×	✓
N	1883	1883	1883	1883	1883	1883	1883	1883
log likelihood ITT No Controls: -1524.4148 || log likelihood ITT With Controls: -1451.5379								
log likelihood LATE No Controls: -1520.8123 || log likelihood LATE With Controls: -1449.1671								

Notes: The table shows the multinational probit estimates of being eligible for the CCT program (ITT) as well as receiving the CCT 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, indicator for rural area, indicator if head of household head was male and indicator if child speaks indigenous language. Standard errors in parenthesis are bootstrapped and clustered at the parish level with 1000 replications. *significant to 10%; **significant to 5%; ***significant to 1%.

Table C.3: Multinational Probit Model of Household Decisions over Child Activities (Extended)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	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
CCT ITT	0.346**	Base	0.205	0.190	0.304*	0.514***	0.256**	0.467***
	(0.160)		(0.142)	(0.126)	(0.158)	(0.128)	(0.127)	(0.163)
CCT LATE	1.135	Base	0.562	0.597	1.198**	1.734***	0.836*	1.732***
	(0.696)		(0.473)	(0.464)	(0.576)	(0.512)	(0.477)	(0.642)
Controls	✓	✓	✓	✓	✓	✓	✓	✓
N	1883	1883	1883	1883	1883	1883	1883	1883

log likelihood ITT No Controls: -3162.4863 || log likelihood ITT With Controls: -2897.6325

log likelihood LATE No Controls: -3152.522 || log likelihood LATE With Controls: -2889.6609

Notes: The table shows the multinational probit estimates of being eligible for the CCT program (ITT) as well as receiving the CCT 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, indicator for rural area, indicator if head of household head was male and indicator if child speaks indigenous language. Standard errors in parenthesis are bootstrapped and clustered at the parish level with 1000 replications. *significant to 10%; **significant to 5%; ***significant to 1%.

Table C.4: Model Parameters

Parameter	Description	Moments To Be Matched	Subsidy Scenario		
			Value	Target	Model
Discrete Case					
α	baseline human capital	Idleness	2.2000	0.68	0.6800
v^s	school ability	Work	6.7000	0.12	0.1200
η	human capital productivity	School	0.9400	0.20	0.2000
ψ	leisure weight	F.O.C.	1.2252	-	-
c	cost of schooling	Fixed	1	-	-
v^w	work ability	Fixed	2	-	-
w	child wage	Fixed	1	-	-
τ^s	subsidy transfer	Fixed	0.35	-	-
τ	lump sum transfer	Fixed	-	-	-
		Continuous Case			
α	baseline human capital	Idleness	2.0410	0.68	0.6801
v^s	school ability	Work	7.5102	0.12	0.1200
η	human capital productivity	School	1.2404	0.20	0.1998
ψ	leisure weight	F.O.C.	1.2252	-	-
c	cost of schooling	Fixed	1	-	-
v^w	work ability	Fixed	2	-	-
w	child wage	Fixed	1	-	-
τ^s	subsidy transfer	Fixed	0.35	-	-
τ	lump sum transfer	Fixed	-	-	-

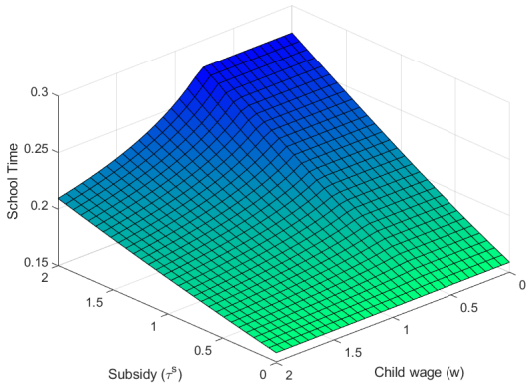
Table C.5: Model Parameters (Cont.)

Parameter	Description	Moments To Be Matched	Lump Sum Scenario		
			Value	Target	Model
Continuous Case					
α	baseline	Idleness	2.2010	0.68	0.6800
	human capital		7.7000	0.12	0.1200
v^s	school ability	Work	0.8900	0.20	0.2000
η	human capital	School	1.2252	-	-
	productivity		1	-	-
ψ	leisure weight	F.O.C.	2	-	-
c	cost of schooling	Fixed	1	-	-
v^w	work ability	Fixed	-	-	-
w	child wage	Fixed	0.07	-	-
τ^s	subsidy transfer	Fixed			
τ	lump sum transfer	Fixed	-	-	-
		Continuous Case			
α	baseline	Idleness	1.8428	0.68	0.6801
	human capital		9.8927	0.12	0.1200
v^s	school ability	Work	1.0951	0.20	0.1999
η	human capital	School	1.2252	-	-
	productivity		1	-	-
ψ	leisure weight	F.O.C.	2	-	-
c	cost of schooling	Fixed	1	-	-
v^w	work ability	Fixed	-	-	-
w	child wage	Fixed	0.07	-	-
τ^s	subsidy transfer	Fixed	0.35	-	-
τ	lump sum transfer	Fixed	-	-	-

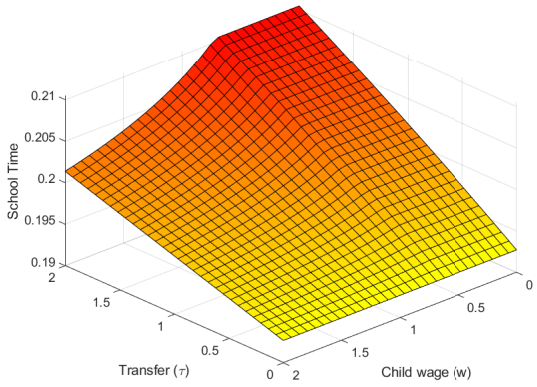
C.3 Model Results

Figure C.3: Comparative Statics

(a) Subsidy Scenario: School



(b) Lump Sum Scenario: School

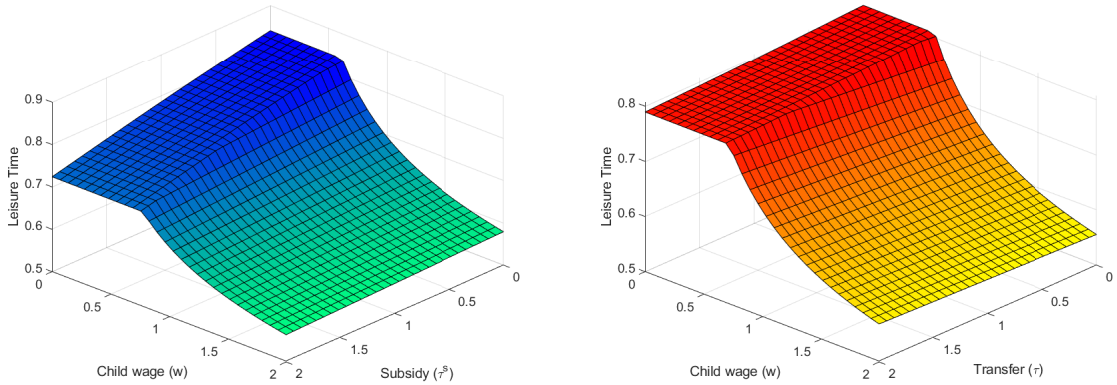


Notes: The figure illustrates how equilibrium child time allocation reacts to different combinations of transfer magnitude and child wage. The endowment of time has been normalized to one. These calculations come from solving the model under the parametric values assigned in Table C.4. In each plot, the axis measure a proportional increases/decrease of the values of the variable in relation to the benchmark value, represented by one (the range goes form zero to twice the amount of the benchmark value).

Figure C.4: Comparative Statics

(a) Subsidy Scenario: Leisure

(b) Lump Sum Scenario: Leisure

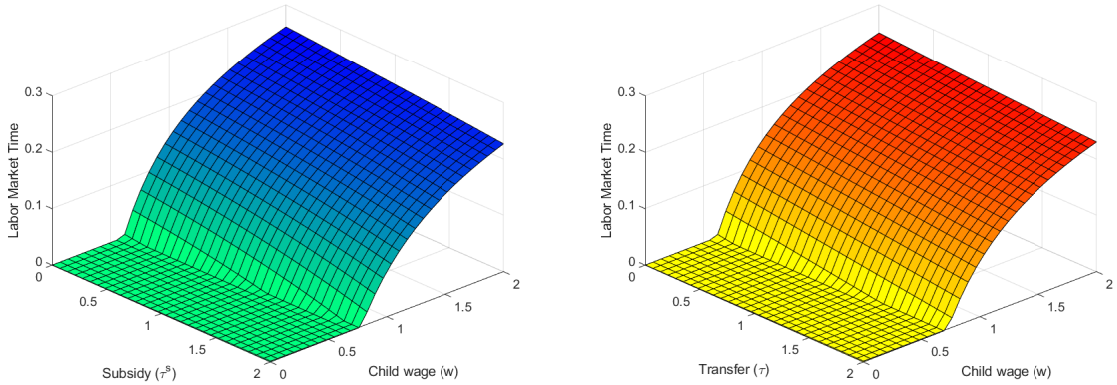


Notes: The figure illustrates how equilibrium child time allocation reacts to different combinations of transfer magnitude and child wage. The endowment of time has been normalized to one. These calculations come from solving the model under the parametric values assigned in Table C.4. In each plot, the axis measure a proportional increases/decrease of the values of the variable in relation the benchmark value, represented by one (the range goes form zero to twice the amount of the benchmark value).

Figure C.5: Comparative Statics

(a) Subsidy Scenario: Work

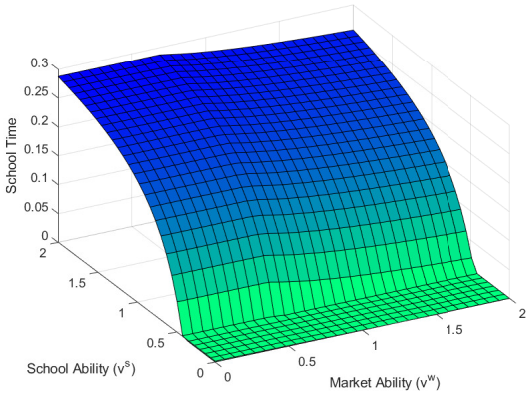
(b) Lump Sum Scenario: Work



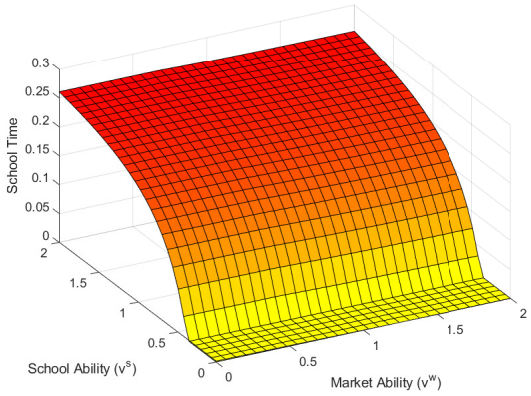
Notes: The figure illustrates how equilibrium child time allocation reacts to different combinations of transfer magnitude and child wage. The endowment of time has been normalized to one. These calculations come from solving the model under the parametric values assigned in Table C.4. In each plot, the axis measure a proportional increases/decrease of the values of the variable in relation to the benchmark value, represented by one (the range goes form zero to twice the amount of the benchmark value).

Figure C.6: Comparative Statics

(a) Subsidy Scenario: School



(b) Lump Sum Scenario: School

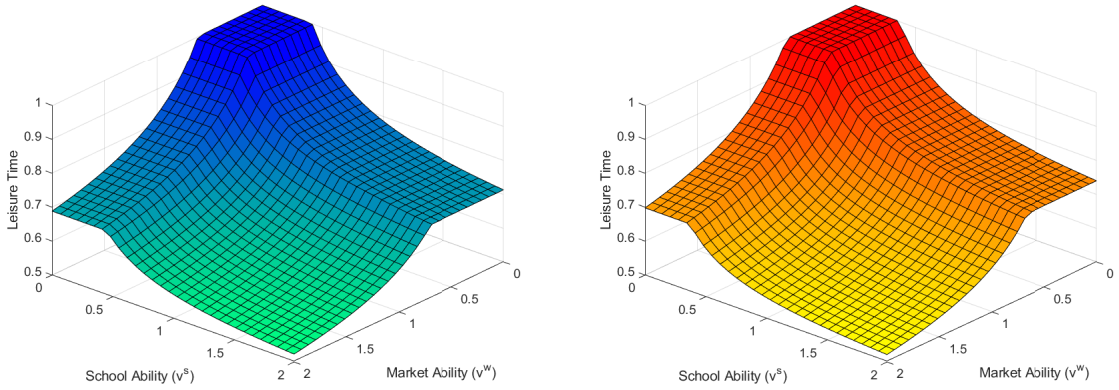


Notes: The figure illustrates how equilibrium child time allocation reacts to different combinations of school and market ability. The endowment of time has been normalized to one. These calculations come from solving the model under the parametric values assigned in Table C.4. In each plot, the axis measure a proportional increases/decrease of the values of the variable in relation to the benchmark value, represented by one (the range goes form zero to twice the amount of the benchmark value).

Figure C.7: Comparative Statics

(a) Subsidy Scenario: Leisure

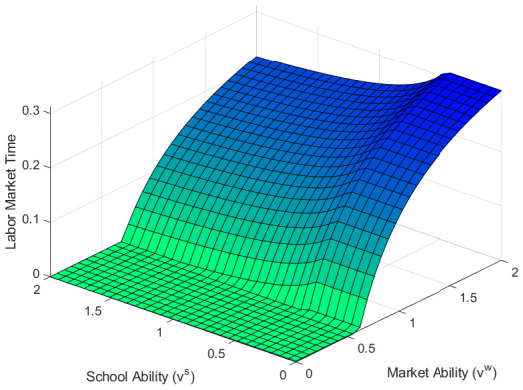
(b) Lump Sum Scenario: Leisure



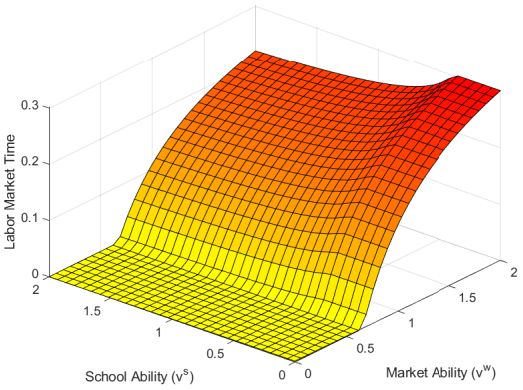
Notes: The figure illustrates how equilibrium child time allocation reacts to different combinations of school and market ability. The endowment of time has been normalized to one. These calculations come from solving the model under the parametric values assigned in Table C.4. In each plot, the axis measure a proportional increases/decrease of the values of the variable in relation to the benchmark value, represented by one (the range goes form zero to twice the amount of the benchmark value).

Figure C.8: Comparative Statics

(a) Subsidy Scenario: Work



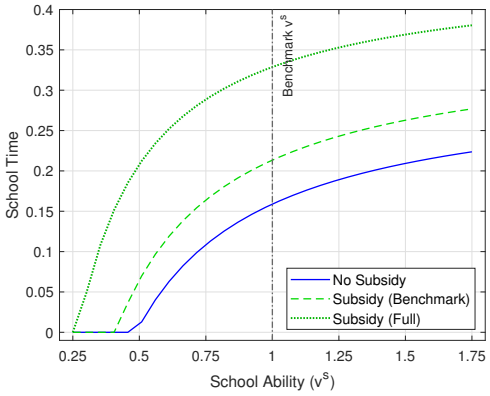
(b) Lump Sum Scenario: Work



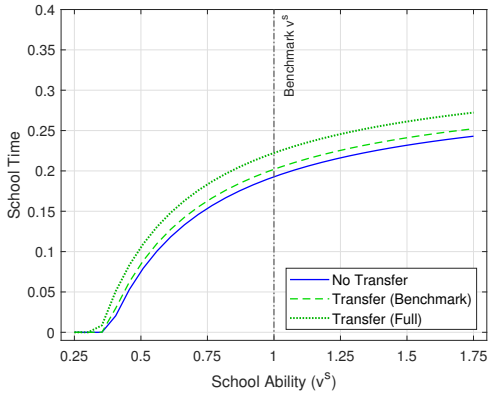
Notes: The figure illustrates how equilibrium child time allocation reacts to different combinations of school and market ability. The endowment of time has been normalized to one. These calculations come from solving the model under the parametric values assigned in Table C.4. In each plot, the axis measure a proportional increases/decrease of the values of the variable in relation to the benchmark value, represented by one (the range goes form zero to twice the amount of the benchmark value).

Figure C.9: Effect of the Cash Transfer on Schooling

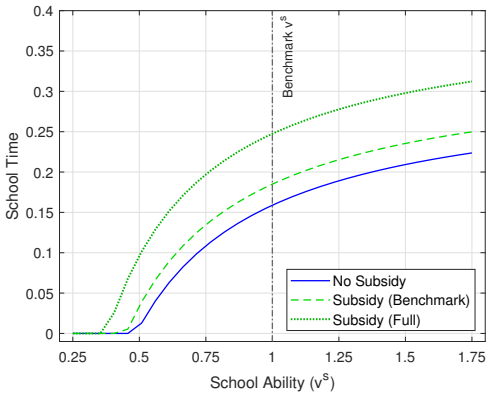
(a) Subsidy Scenario: Low Market Ability



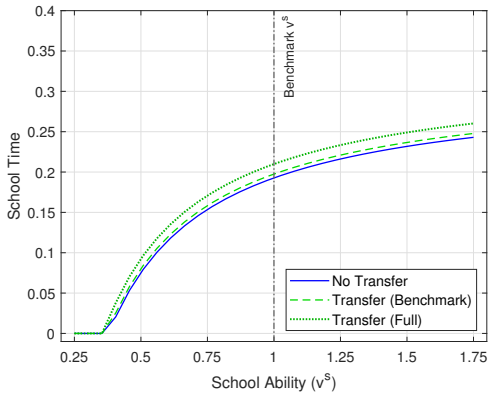
(b) Lump Sum Scenario: Low Market Ability



(c) Subsidy Scenario: High Market Ability



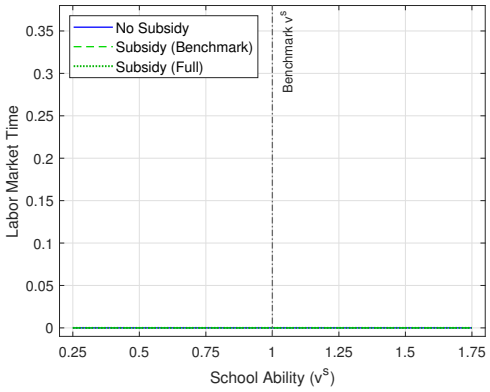
(d) Lump Sum Scenario: High Market Ability



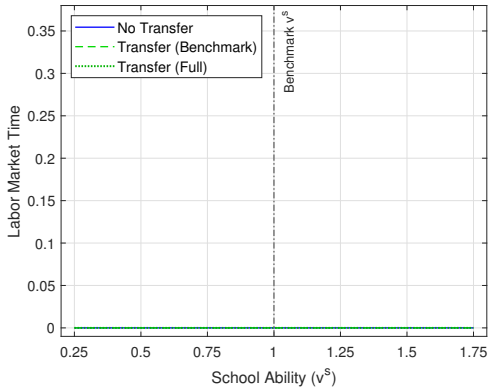
Notes: The blue solid line represents a no transfer scenario, the green dashed line represents the benchmark cash transfer scenario and the green solid line represents an scenario where the transfer cover full education costs. The first two panels show a scenario where the child is endowed with low market ability and the bottom panels portray a situation where the child is endowed with high market ability. Panels in the left show scenarios with a subsidy structure of the cash transfer whereas panels in the right show scenarios with a lump sum structure of the cash transfer. These calculations come from solving the model under the parametric values assigned in Table C.4.

Figure C.10: Effect of the Cash Transfer on Market Work

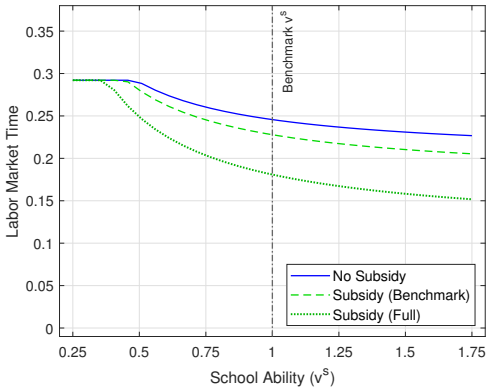
(a) Subsidy Scenario: Low Market Ability



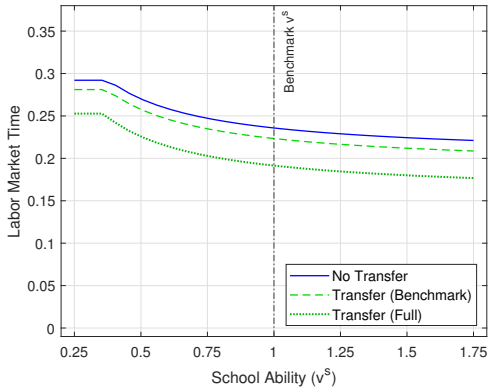
(b) Lump Sum Scenario: Low Market Ability



(c) Subsidy Scenario: High Market Ability



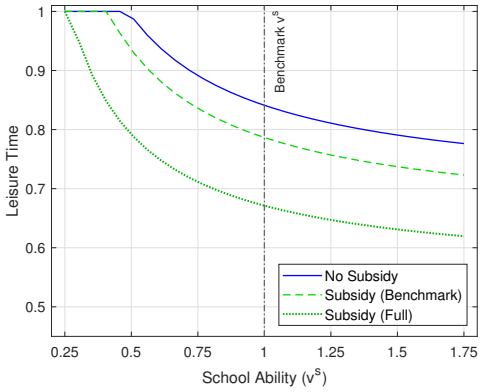
(d) Lump Sum Scenario: High Market Ability



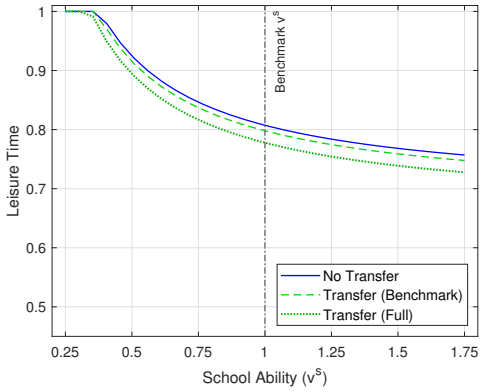
Notes: The blue solid line represents a no transfer scenario, the green dashed line represents the benchmark cash transfer scenario and the green solid line represents an scenario where the transfer cover full education costs. The first two panels show a scenario where the child is endowed with low market ability and the bottom panels portray a situation where the child is endowed with high market ability. Panels in the left show scenarios with a subsidy structure of the cash transfer whereas panels in the right show scenarios with a lump sum structure of the cash transfer. These calculations come from solving the model under the parametric values assigned in Table C.4.

Figure C.11: Effect of the Cash Transfer on Leisure

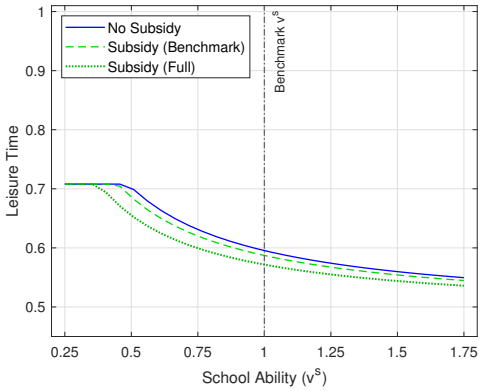
(a) Subsidy Scenario: Low Market Ability



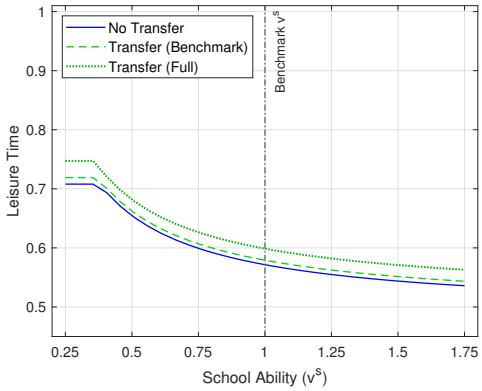
(b) Lump Sum Scenario: Low Market Ability



(c) Subsidy Scenario: High Market Ability



(d) Lump Sum Scenario: High Market Ability



Notes: The blue solid line represents a no transfer scenario, the green dashed line represents the benchmark cash transfer scenario and the green solid line represents an scenario where the transfer cover full education costs. The first two panels show a scenario where the child is endowed with low market ability and the bottom panels portray a situation where the child is endowed with high market ability. Panels in the left show scenarios with a subsidy structure of the cash transfer whereas panels in the right show scenarios with a lump sum structure of the cash transfer. These calculations come from solving the model under the parametric values assigned in Table C.4.