Efficient Delivery of Cash Transfers to the Poor: Improving the Design of a Conditional Cash Transfer Program in Ecuador*

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Abstract

Many governments provide monetary transfers to low-income families. The mechanism through which these subsidies are distributed may contain several inefficiencies that diminish the net-value obtained by the recipients. In this paper, we build and estimate a behavioral dynamic model that allows us to evaluate the efficiency of current and alternative distribution mechanisms. The proposed model is simple and resembles the individual's decision to collect the transfer. To estimate it, we use data from a cash transfer program in Ecuador where recipients incur high transaction costs each time they collect their benefits. Despite its simplicity, our model is able to replicate the observed data remarkably well. We use it to simulate alternative payment mechanisms and show that an adequate design of the delivery of payments can substantially increase the value of cash transfer programs.

Keywords: Cash Transfer Programs, Behavioral Model, Distribution of Payments
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1 Introduction

Conditional Cash Transfer (CCT) programs consist of monetary transfers to low income families that aim to alleviate extreme poverty, while providing households with incentives to increase their consumption of education and health services. These type of programs have become an important part of social assistance in Latin America and have dramatically expanded during the past decade.[1]

Many efforts have been made to measure the effects of such transfers on recipients' well-being. Using controlled social experiments, researchers have found that children of families who receive transfers consume more health services, are more likely to attend school, and less likely to be part of the labor force (Behrman, Sengupta and Todd 2005, Schady and Paxson 2007, Schady and Araujo 2006, and Schulz 2004, for example).

While these previous studies provide evidence of the overall positive effects that CCT programs have on children's school enrollment and health care, less is known about the benefits or costs associated with the current programs' design. For instance, there are many dimensions in which CCT programs differ (rules about eligibility, conditionality, payment schedules, delivery of the payments, etc.), and there may exist important inefficiencies in program implementation. Todd and Wolpin (2006) and Bourguignon, Ferreira, and Leite (2003) use behavioral models to address this question and simulate and evaluate alternative

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[1]The first Latin American CCT program started in 1995 in Brazil under the government of the Distrito Federal of Brasilia (Bolsa Escola). The second experience of a CCT program is Mexico's Progresa (now renamed Oportunidades) which began in 1997. Other Latin-American countries that have implemented CCT programs in the past decade include Argentina (Familias por la Inclusion Social), Chile (Chile Solidario), Colombia (Familias en Acción), Costa Rica (Superémonos), Ecuador (Bono de Desarrollo Humano), Honduras (Programa de Asignacion Familiar), Jamaica (Programa de Avance Mediante la Salud y la Educacion), Nicaragua (Red de Protección Social), and Uruguay (Proyecto 300). See Rawlings and Rubio (2003) and Caldés, Coady, and Maluccio (2004) for reviews.

programs in Mexico's *Progresa* and Brasil's *Bolsa Escola*, respectively. Both studies conclude that transfers' conditionality has an important effect on school attendance, and Todd and Wolpin suggest that alternative payment schedules may induce a greater impact on average school attainment.[2]

In this research, we analyze the design of another dimension of CCT programs that, to our knowledge, has not been considered in previous studies. We focus on the mechanism through which governments distribute payments to the beneficiaries. This is an important feature of these programs since there may be high transaction costs involved in the distribution of these transfers, such as transportation, opportunity, and other related costs incurred by both governments and recipients. For this reason, an adequate design of the delivery of payments could drastically increase the value of a CCT program.

To address this issue, we specify and estimate perhaps the most basic version of a behavioral dynamic model that resembles the individual's decision to collect the transfer. Unlike other behavioral models in the literature, ours is simple and easy to solve.[3] Despite its simplicity, we show that it may be a powerful tool for designing the delivery of payments of a CCT program.

We focus on one particular CCT program in Ecuador: the *Bono de Desarrollo Humano* (BDH). The program consists of cash transfers to a) low-income mothers with children younger than 16 who receive benefit payments of $15 per month and b) elderly and/or

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[2]More importantly, Todd and Wolpin provide evidence that these types of models may be able to replicate the counterfactuals of interest reasonably well by comparing the predictions of their model with those derived from a randomized experiment.

[3]In practice, behavioral models are difficult to implement. In particular, as the state space increases, computing the solution to the model involves advanced numerical methods and approximations (Berkovec and Stern 1989, Keane and Wolpin 1994, 1997 and 2001) that, perhaps, has discouraged many applied researchers to undertake this approach.

disabled low-income individuals who are entitled to $11.50 per month. As of December 2004, low-income mothers accounted for more than 80% of the total number of beneficiaries. The subsidy is delivered through a payment agency network, composed of 17 financial institutions with approximately 250 payment centers distributed in rural and urban areas of Ecuador. Beneficiaries must travel to one of these agencies and approach the counters/booths to collect their cash. The government provides individuals with the option to cash any -accumulated- subsidy once every one, two, three or four months.

While in most urban areas there is a relative large supply of payment agencies, in many rural areas there is a clear shortage. For instance, in certain rural areas, beneficiaries need to travel for close to two hours to the nearest payment agency. The inefficiency of the program's payment system has been criticized in several government reports which state that, in some cases, the recipients' transportation costs may account for more than 50% of the transfer itself.[4] Partially for this reason, a redesign of the mechanism of the payment's delivery is under consideration.[5] The behavioral model specified in this paper aims to facilitate this task.

The model is simple and intuitive. Each period (month), beneficiaries have the right to receive a lump-sum payment from the government. To receive this payment, households incur transportation costs that are a function of the travel time from their residences to

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[4]Some beneficiaries live in remote areas and travel for about 2 hours to collect the transfer from the nearest payment agency. In a few internal staff reports from the Central Bank of Ecuador (and other local agencies), it is estimated that the average bus fare for such trips is close to $3 per one-way trip. If the opportunity cost of traveling is 50 cents per hour, it is reported that transportation costs alone may account for more than 50 percent of the cash transfer. It is likely, however, that these direct expenses of traveling overestimate the beneficiaries' collection costs for the following reasons. Firstly, it is plausible that beneficiaries travel to urban centers on regular basis for other reasons (to commercialize agricultural products, for example) and use this opportunity to collect their subsidy. Secondly, if rural households organize themselves and send one delegate to collect several cash-transfers, the per-subsidy transportation costs decrease.

[5]At the time we started this study (April 2005), authorities of the Central Bank of Ecuador and the Ministries of Finance and Welfare were considering a redesign of the program.

the closest payment agency. Households are heterogeneous in their location and in their opportunity costs. From each individual's perspective, future opportunity costs are random. Given these assumptions, a household rationally chooses between collecting the transfer in the current period or waiting to redeem the accumulated subsidy in the next period. Thus, households that are located closer to payment agencies or that experience lower opportunity costs have stronger incentives to redeem the transfer more often.

We estimate the model using Simulated Maximum Likelihood methods and administrative data provided by the Ministry of Social Welfare in Ecuador. The data consist of subsidy-payment and demographic information from a random sample of approximately 2,500 households (mothers) during 2004.[6] The payment data allow us to identify if a beneficiary decided to collect the transfer in any given month and, if so, the amount received. We also observe several characteristics of the mother, such as her geographical location, level of education, and marital status. In addition, we measure beneficiary accessibility to the payment agencies by estimating the travel distance between the town where the beneficiary resides and the closest town with a payment agency.

The structural estimates have a direct economic interpretation. For example, our results suggest that the time-opportunity cost of beneficiaries is close to $0.40 per hour. This is a reasonable estimate considering that the minimum hourly wage in Ecuador was close to $1 in 2004. More importantly, despite the simplicity of our model, we believe that it is able to replicate the observed data remarkably well. For this reason, we use it to conduct several counterfactual experiments of alternative payment mechanisms.

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[6]Because behavior of disabled beneficiaries may be significantly different than that of mothers, we restrict our sample to the latter group.

The first counterfactual we consider consists of increasing the number of periods that households are allowed to accrue their payments (from four to six months). Interestingly, the recipient's welfare gains from such a policy are very small. We compute another counterfactual that allows us to quantify the household's welfare effects if the government increases the number of payment agencies in rural locations. In particular, we assume that new payment agencies are built such that the home-to-agency travel time of a representative rural household decreases by 60 minutes. We estimate that such policy would increase the value of being enrolled in the program by about 4%. Finally, the model is used to create a geographically differentiated schedule of payments that compensates rural households for their travel time-opportunity costs.

In the following section, we present the details of the BDH program. Section 3 contains a detailed description of the data sources, including the estimation of several reduced form specifications. Section 4 presents the model and the estimation methods. In Section 5, we include an economic interpretation of our estimates, an assessment of the within-sample fit, and evaluations of alternative payment programs. Finally, the last section concludes.

2 The BDH program

2.1 Overview

The Bono de Desarrollo Humano (BDH) is a conditional cash transfer program (CCT) in Ecuador administered by the Ministry of Social Welfare. The program consists of monthly cash transfers to low income families. The BDH has two types of beneficiaries: a) low-income mothers with children younger than 16, who receive $15 per month in benefits, and b) elderly and/or disabled low-income individuals, who are entitled to $11.50 per month.

The program is the most important social assistance program in Ecuador and is by far the government's largest social expenditure outside of education, with total transfers equal to nearly 8% of Central Government non-debt spending and about one percent of GDP (León, Vos, and Brborich, 2001).[7]

The BDH program started in 2003 by merging two previously existing programs, the Bono Solidario (BS) and the Beca Escolar (BE). The BS was designed as a safety net to compensate poor families for the elimination of gas and electricity subsidies in 1998 and targeted mothers with earnings below US$ 40 dollars per month, people with disabilities, and senior citizens.[8] On the other hand, the BE was a CCT program implemented in the late 1990s. The program consisted of monthly transfers of $5 per child (up to two children per household), which was conditional on the children's enrollment in school and a 90% attendance rate. This program benefited approximately 150,000 households.

The Bono de Desarrollo Humano (BDH) includes all recipients of the BS and the BE, and it aims to increase children's health and school enrollment. For this reason, mothers were required to a) enroll their children (ages 6 to 15) in school and allow them to attend at least 90% of the school days, and, b) bring their children (ages six and under) to health

[7]By comparison, in 2004, Central Government Health expenditures was only 5.9% of total non-debt spending and a bit less than one percent of GDP; public education accounts for two-and-a-half percent of GDP.

[8]The BS consisted of a modest unconditional transfer that was non-trivial by Ecuadorian standards. At the time that the program started, mothers received 100,000 sucres per month, and senior citizens and people with disabilities received 50,000 sucres (about 13% and 6.5% of the official monthly minimum wage, respectively). In April of 1999, those amounts were increased by 50%, mostly to account for high inflation. During 2000, the program reached around 1.2 million beneficiary households, representing about 45 percent of Ecuadorian households. Some studies suggest that, by the year 2000, the BS had a positive effect on school enrollment and children's nutritional status. For example, an impact evaluation of the BS, conducted by León, Vos, and Brborich (2001), who used a propensity score matching method, showed a positive impact of around 5 percentage points on school enrollment, although no significant impact was found on poverty indicators. Another study, conducted by León and Younger (forthcoming), who implemented an instrumental variable approach, shows that the program had very minor, yet significant and positive effects on children's nutritional status.

centers for medical check-ups twice a year. However, unlike the other CCT programs in Latin America, the BDH has no mechanisms to verify that these conditions are being met. Consequently, households are not taken off program rosters if mothers fail to comply with the requirements.[9] Transfers to elderly and disabled individuals remained unconditional.

2.2   Selection of beneficiaries

The eligibility criteria for the 1998 BS were straightforward, targeting low-income a) mothers, b) old aged individuals, and c) disabled.[10] At the beginning of the program, potential recipients filled application forms at local churches and were admitted to the program if they complied with the eligibility criteria. Unfortunately, there was no external validation of the data on the application forms, and there is evidence that many non-eligible individuals were admitted early in the program.[11]

Soon after the implementation of the BS, the Ecuadorian government looked for better instruments to verify eligibility. For instance, starting in 2000, the government made efforts to create a more comprehensive poverty proxy-mean index for individuals using targeted surveys. This index, known as the Selben-index,[12] identifies potential beneficiaries of social

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[9]However, at the beginning of the program in 2003 some television programs were transmitted, at a national level, publicizing the obligation of parents to send children to school in order to receive the transfer. Those informational advertisements may create some level of awareness on the obligation of parents to send their children to school and take them to the health centers in order to benefit from the program (Schady and Araujo 2006).

[10]The Executive Decree Number 129 of the Government of Ecuador established the following eligibility criteria for those receiving the Bono: I) Mothers: a) Need to have at least one child younger than 18 years of age; b) Family income should not exceed 1 million sucres; c) Mothers nor spouses should not have a "fixed" salary income. II) Old Aged: a) Older than 65 years of age; b) Family income should not exceed 1 million sucres; c) Do not have a "fixed" salary income. III) Disabled: a) Between 18 and 65 years of age; b) Disability of at least 70% (according to the Ecuadorian Social Security Institute standards). Notice that, neither eligibility nor the cash transfer itself, depends on the family size or the number of children of the mother.

[11]For example, Parandekar (1999) finds that, in 1999, about 50% of the Bono recipients did not meet the eligibility criteria laid down by the Government.

[12]Selben ("Sistema de Identificación y Selección de Beneficiarios") stands for Beneficiaries' Identification and Selection System.

programs by classifying households according to an unmet basic needs index which is computed using non-linear principal components analysis. This index is scaled from 0 for the poorest to 100 for the richest.

In 2004, most beneficiaries of the BDH were selected using the Selben criterion. Only those families that score less than 50.65, in the Selben index qualify to receive the benefit (these are families that belong to poverty quintiles 1 and 2). By then, around 90 percent of the beneficiaries of the program had a corresponding Selben index score. The remaining ten percent includes families that have not been given the Selben survey but had received benefits from the program since its initial implementation.

2.3   Payment distribution

Since the BDH began in 1998, Banred, a network of banks and agencies in Ecuador, has been in charge of the subsidy payment.[13] The network is composed of 17 financial institutions with about 250 payment agencies distributed in rural and urban areas of Ecuador where recipients may cash their benefits.[14] Beneficiaries must physically travel to one of these agencies and approach the counters/booths to collect their cash. Individuals may accrue payments for up to four months.

Beneficiaries can designate a third party to collect the transfer. To do this, recipients must sign a notarized document stating the name and identification number of the individual authorized to collect their money. The process to obtain this document is simple and can

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[13]More information about Banred can be found at http://www.banred.fin.ec.

[14]Banred had a significantly higher number of bank agencies in 2004. Particularly in urban areas, however, it restricted the delivery of cash transfers to a notably lower number of branches. We do not know which agencies had been formally designated to operate as payment points. However, we observe the total number of transfers that had been distributed from each of the Banred's agencies. In about 320 branches, there was at least one transaction during 2004. To identify payment points, we select those with an average of 20 or more transactions per month and find that 256 fit this criterion. The results of the paper are robust to this definition.

be completed in one day. However, it could be expensive since notary offices are typically located in urban centers and the fee for such a document was close to $20 in 2004. We are not aware of any official information about the relevance of this practice. We can only document statements from Banred workers that suggest this practice is rare.[15]

While in most urban areas there is a relative large supply of payment agencies, in many rural areas there is an evident shortage. To highlight this problem we present in Table 1 the geographical distribution of beneficiaries and payment agencies of the BDH in 2004. As shown in this Table, a large share of beneficiaries resides in two provinces, Pichincha and Guayas, where the country's two biggest urban centers are located. Not surprisingly, in these two provinces, more than 75 percent of the beneficiaries could find an available payment agency in the same *Parroquia*[16] where they lived. Their situation contrasts with that of individuals who reside in more rural areas. For example, in Zamora Chinchipe, a rural province in the Amazonian jungle, only 3 percent of the recipients lived in the same Parroquia where a payment point was available.

[Please, insert Table1]

As shown in Table 1, the coverage level of payment agencies in rural areas is low. This raises several important questions. Is it worth it to increase the coverage level of payment agencies in rural areas? How efficient is the current payment system? Can the payment system be improved? In this research, we aim to answer these questions by specifying and estimating a behavioral model that depicts the individual decisions of collecting the transfer.

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[15] Although this is not a common practice, Banred staff was aware of a handful of individuals that had been delegated to collect several hundreds of transfers each month in two rural payment agencies. According to their statements these individuals charge recipients between $0.25 and $1 for providing this "service".

[16] Ecuador is divided in 22 provinces and each province is composed of several smaller areas called Parroquias. There are about 1,200 Parroquias in Ecuador in both urban and rural areas. In rural areas, Parroquias have on average 230 square kilometers and 4,172 residents.

The estimated model will be used to simulate counterfactuals and evaluate the welfare effects of alternative payment mechanisms.

3 Data and reduced form analysis

In this section, we describe the data sources that we have gathered for our empirical analysis. Then, we use simple reduced form models to identify the determinants of the beneficiaries' collection decisions, which later, will guide the empirical specification of the behavioral model.

We have collected data from several sources. Our first source is an administrative payment database managed by Banred. This database records every payment issued to the universe of recipients (1.07 million in December 2004) from January to December 2004. We observe if a beneficiary decided to collect the transfer in any given month and, if so, the amount of the subsidy received.[17] In addition, the database identifies whether the recipient is a mother, an elderly or a disabled individual. In this study, we face the unusual situation of having too much data. We observe the universe of transactions of about 1 million beneficiaries over 12 months. Ideally, we would like to use all the observations in our estimation process. However, estimating the structural model (details are provided in the next section) is computationally expensive and forces us to work with a smaller number of observations. Since we focus on the behavior of low-income mothers, we choose to work with a random sample of 3,000 mothers from the payment database. While this number is large enough to provide precise estimates, it is small enough to make the estimation process feasible.

Even though Banred's database has very detailed payment data, it offers very little

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[17]For example, we have information whether an individual received $15 in January, $0 in February, $0 in March, $45 in April, etc.

information about the demographic characteristics of the beneficiaries. However, it includes an individual identifier that may be used to match our sample with the Selben database. As we mentioned in the previous section, the Selben database provides information on many household's demographics such as the geographical location of the recipients (up to the Parroquia level), their education level, marital status, and number of children. Furthermore, certain characteristics of the beneficiaries' housing unit, such as its size and tenure status, are available and provide us with a measure of the household's wealth. In 2004, about 90% of the BHD's recipients had a corresponding Selben index score.[18] Thus, when our payment-sample is matched with the Selben's database, our matched database decreases to 2,523 observations.[19]

Finally, we compute a measure of the beneficiaries' accessibility to the Banred's payment agencies. Ideally, we would like to know the travel time from every beneficiary's residence to the closest payment agency, referred to as the home-to-agency travel time hereafter. Since we cannot obtain such information, we approximate it by estimating the travel distance between the biggest town of the Parroquia where the beneficiary resides and the closest town with a payment agency. These data were computed by the Ecuadorian Ministry of Welfare using software from the Ecuadorian Geographical Military Institute. When computing this variable, it is assumed that all vehicles travel at the legal speed limit and that no other waiting is involved when traveling. Furthermore, if the beneficiary lives in a Parroquia where a payment agency is available, the estimated travel distance is zero.[20]

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[18]The difference is composed of families that were not given the Selben survey, but have received the program since its initial implementation.

[19]In addition to the observations that we could not find in the Selben's database, we dropped from our sample 92 observations that reported subsidies of $11.5 per month (the subsidy received by the "elderly" and "disabled") rather than $15 (the transfer received by "mothers").

[20]We acknowledge that there may be several sources of measurement error in this variable. For example,

In Table 2 we present descriptive statistics of our matched database. On average, beneficiaries collect the subsidy eleven times during 2004. However, while some individuals receive the subsidy every month, others do it only four times during the year. Individuals, on average, live in a Parroquia that was located 15 minutes away from a payment agency. However, there is significant variation in the beneficiaries' travel times. For example, while some individuals live in the same area where a designated payment agency operates (and have zero travel costs), others spend almost two hours to travel from their residence to the closest Parroquia with a payment point. In our sample, 62 percent of the recipients live in an urban area (as defined by the Ecuadorian 2000 Census) and 90 percent have received at least some type of formal education. Close to three quarters of the mothers in our sample have partners (either married or living together) and, the average mother has 3.5 children. Most recipients live in small units (one room) although a few households who reside in medium size dwellings (five rooms) still qualify for the subsidy.[21] Only 18 percent of mothers owns their home, which again illustrates the fact that the BDH is targeted towards low income families. Finally, we include the Selben index for every mother in our sample. Recall that this index is between 1 and 100, and those households who score less than 50.65 are eligible to receive the subsidy. The mean index is 40.6, about ten points below the cutoff.

[Please, insert Table 2]

To identify the determinants of the beneficiaries' collection decisions of the subsidy we

in rural areas, roads are not properly maintained, which makes it difficult to travel at the speed limit. On the other hand, there is very little speed-limit enforcement in Ecuador meaning that, despite the roads' conditions, some drivers may be traveling at higher speeds.

[21]Staff members from the Ministry of Social Welfare documented, however, that a few of the active recipients who still lacked a Selben score in 2004 qualified for the program (when it was initially implemented) despite living in very large residences, some of them with up to 13 rooms. Since these types of beneficiaries lacked a Selben score at the time we collected the data, they are excluded from our sample.

use a simple linear regression model. The dependent variable is the number of times that mothers collected the $15 subsidy in 2004. The explanatory variables include household's demographics, regional fixed effects, and the distance from the recipient's residence to the closest payment agency. The first column of Table 3 presents a baseline model, and the other three columns explore alternative specifications.

Because the traveling patterns of individuals residing in urban areas significantly differ from those of individuals living in rural areas, we allow the effects of distance to vary in both of these areas. In both urban and rural households, we expect to observe a negative relationship between the home-to-agency travel time and the number of times that the subsidy was collected. As expected, this coefficient is negative and robust across every specification. However, the estimated effect is somewhat small. For instance, a rural household that lives 90 minutes away from a payment agency is expected to cash her payment two times less than an identical counterpart who lives in the same town where the agency is located. In urban areas, the effect is still negative but significantly smaller.

From this point forward, we focus on the most complete specification, which is presented in the fourth column of Table 3. Demographic variables such as age, education, marital status, and number of children have little explanatory power, although there is some evidence that women who have a partner have a higher expected number of subsidy redemptions in a given year. The number of rooms and the tenure of a housing unit are indirect measures of the household's wealth. A negative sign in their corresponding coefficients is expected since the opportunity cost of traveling increases with wealth. As expected, both coefficients are negative and highly significant. Finally, the inclusion of 21 regional fixed effects (province dummy variables) greatly increases the explanatory power of the model. These dummy

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variables are probably capturing other characteristics of the regions that are likely correlated with the beneficiaries' accessibility to the payment agencies (such as the availability of public transportation, for example).

[Please, insert Table 3]

The reduced form models shown in this section are useful tools to understand why certain families collect the subsidy more often than others. They highlight the observed correlations in the data and will serve as a guide for the empirical model's specification.[22]

4   The model

4.1   A stylized theoretical specification

In this section, we specify a theoretical model that resembles the collection decisions of a representative cash transfer beneficiary. We start by assuming that the beneficiary is an infinitely-lived rational agent. Every period t she has the right to receive a lump-sum payment of M monetary units from the government. Payments may be accumulated for up to $\bar{a}$ periods.[23] To redeem this payment, individuals need to travel for d minutes and incur a transportation cost $c(d)$.

Let $u_t(a)$ be the net utility that she obtains when collecting her payment

$$u_t(a) = g\left[aM - c(d)\right] + \varepsilon_t, \tag{1}$$

where $g(.)$ is a non-decreasing continuous function, a is the number of periods since the last transfer was received, and ε_t is a random utility component. At time t, ε_t is revealed to the

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[22]We have also estimated probit models where the dependent variable takes the value of one if the family received the transfer in a particular month and zero otherwise. The independent variables include the same variables used in the linear regression model. The probit estimates are consistent with those displayed on Table 3 and can be requested from the authors.

[23]That is, if the last transfer was recieved a periods ago, the total monetary amount that the beneficiary is eligible to receive in the current period is $j \cdot M$, where $j = \min\{a, \bar{a}\}$.

individual, but future realizations of this component are unknown.[24] In addition, let ε_t be identically and independently distributed (for all t and a) according to the distribution F, which is common knowledge.

Let $V_t(a)$ be the value of having an option to receive an aM payment in period t. If the beneficiary chooses to redeem her payment in the current period, she receives the instant utility $u_t(a)$ and the discounted expected value of the option to receive the transfer next period $\beta E\left[V_{t+1}(1)\right]$. Otherwise, she will have the option to redeem $(a+1)M$ monetary units in the future, and the value of this choice is $\beta E\left[V_{t+1}(a+1)\right]$. Thus, $V_t(a)$ is the highest of these two choices

$$V_t(a) = \max\left\{u_t(a) + \beta E\left[V_{t+1}(1)\right], \beta E\left[V_{t+1}(a+1)\right]\right\}; \qquad a = 1,..,\bar{a}-1. \qquad (2)$$

Because payments may not be accumulated for more than $\bar{a}$ periods, Equation (2) holds only for values of a smaller than $\bar{a}$. If a equals to $\bar{a}$, Equation (2) becomes

$$V_t(a) = \max\left\{u_t(a) + \beta E\left[V_{t+1}(1)\right], \beta E\left[V_{t+1}(a)\right]\right\}; \qquad a = \bar{a}. \qquad (3)$$

Let $W_t(a) = E\left[V_t(a)\right]$. It can be shown that, given certain standard conditions, there exists a unique $W^*(a)$ for all $a\epsilon\{1,..,\bar{a}\}$ that solves Equations (2) and (3) which is independent of time.[25] Thus, the solution to our theoretical model consists of an optimal strategy $P_t^*(a)$ where, given the current state a, the function $W^*(a)$, and the information available at t, individuals choose to redeem their payment if and only if the utility from collecting the transfer (the left hand side from the maximum operator in Equation 2) is no less than the outside option (the right hand side from the maximum operator in Equation 2).

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[24] Notice that ε_t may be interpreted as the household's time-opportunity costs at time t and that, from the family's point of view, future realizations of these costs are random.

[25] For details, see Appendix.

Notice that, given parametric assumptions, we may solve the model numerically and simulate the recipient's behavior.[26]

4.2 Empirical model

In this section, we incorporate observed and unobserved individual heterogeneity to the stylized theoretical model presented in the previous section and provide specific functional assumptions for $g(.)$, $c(.)$, and F.

We define d_i as the distance between beneficiary i's place of residence and the closest office where she may receive the payment. It is assumed that this distance does not change across time.[27] In addition, let X_i and u_i be a vector of observed and unobserved (from the econometrician's point of view) individual's characteristics, respectively. The observed characteristics include household demographic variables used in the reduced form models. The unobserved individual characteristics capture other idiosyncratic features of the households (such as their health status) that are not available in the data and that may explain their behavior.

We assume a linear specification for both $g(.)$ and $c(.)$. That is,

$$g\left[aM - c\right] = aM - c,$$

and

$$c(d_i, X_i, u_i) = c_0 + c_1 d_i + X_i \gamma + u_i, \tag{4}$$

where γ is a vector of parameters.

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[26]We solve the models recursively. That is, given certain functional form assumptions about $g(.)$, $c(.)$, and F, and a set of parameter values, we compute recursively the values of $W_{\underline{T}}(a), W_{T-1}(a), W_{T-2}(a), ...$until convergence is achieved for all values of a. Once we have evaluated $\{W^*(a)\}_{a=1}^{\bar{a}}$ we may simulate individual's decisions by obtaining realizations from ε_t and applying the optimal rules $P_t^*(a)$.

[27]That is, we assume that neither individuals nor authorized financial institutions move during the time span of our sample (one year).

Finally, we let both ε_{it} and u_i be i.i.d. and normally distributed with mean zero and variance σ_u^2 and σ_ε^2, respectively. Notice that, given $\{d_i, X_i, u_i\}$ and a set of parameter values $\theta = \{\beta, c_0, c_1, \gamma, \sigma_\varepsilon^2\}$, we may solve the model and predict the behavior of each individual.

4.3 Estimation

To estimate our model, we use our database and Simulated Maximum Likelihood Estimation (SMLE) methods. In this section, we specify the relevant likelihood function.

Let P_{it} equal one if the individual i redeems her payment in period t and zero otherwise. In addition, let a_{it} be the number of \$$M$ payments that the beneficiary i may redeem at period t. Notice that, for each individual $i = 1, ...N$ in our sample, we observe the variables $\{P_{it}, a_{it}, d_i, X_i\}_{t=1}^T$.

Given θ and a particular realization of u_i, the likelihood of observing an individual i receiving a transfer of $a_{it}M$ monetary units in period t is equivalent to the probability that the right hand side of Equation (2) is no less that its left hand side. That is,

$$
\begin{aligned}
\Pr\{P_{it} = 1 | a_{it}, X_i, u_i; \theta\} &= \Pr\{a_{it}M - c(d_i, X_i, u_i) + \varepsilon_{it} + \beta W_i^*(1) > \beta W_i^*(a_{it} + 1)\} \\
&= 1 - \Phi\{\beta W_i^*(a_{it} + 1) - a_{it}M + c(d_i, X_i, u_i) - \beta W_i^*(1)\},
\end{aligned}
$$

where Φ is a normal cumulative distribution function with mean zero and variance σ_ε^2, and $a_{it} < \bar{a}$. When $a_{it} = \bar{a}$, this probability becomes

$$
\Pr\{P_{it} = 1 | a_{it}, X_i, u_i; \theta\} = 1 - \Phi\{\beta W_i^*(a_{it}) - a_{it}M + c(d_i, X_i, u_i) - \beta W_i^*(1)\}.
$$

With these definitions, we may compute the conditional likelihood of observing an individual redeeming her payments as

$$
L_{it}^1 | a_{it}, X_i, u_i; \theta = \Pi_{j=1}^{\bar{a}} \left(\Pr\{P_{it} = 1 | a_{it}, X_i, u_i; \theta\}\right)^{a_{itj}},
$$

17

where a_{itj} equals one if $a_{it} = j$ and zero otherwise ($j = 1, .., \bar{a}$). On the other hand, the probability that this individual does not redeem her payment is

$$L_{it}^0 | a_{it}, X_i, u_i; \theta = 1 - L_{it}^1 | a_{it}, X_i, u_i; \theta.$$

Thus, the conditional likelihood contribution of observing the behavior of an individual i during T periods is

$$L_i | u_i; \theta = \Pi_{t=1}^T \left\{ \left[L_{it}^1 | u_i; \theta \right]^{P_{it}} \left[L_{it}^0 | u_i; \theta \right]^{1-P_{it}} \right\},$$

and the unconditional likelihood function of our sample is

$$L = \Pi_{i=1}^N \int (L_i | u_i; \theta) dG(u_i), \tag{5}$$

where G is a normal cumulative distribution function with mean zero and variance σ_u^2.

The integral of the right hand side of Equation (5) will be evaluated using simulation methods. The SMLE parameter estimates are the ones that maximize the log-likelihood of observing this sample.

5   Results

As it was documented in Section 2, the absence of payment points is a predominant problem in rural areas. In addition, estimates from the reduced form models suggest that the home-to-agency distance has a small effect explaining the subsidy collection patterns of urban households. For these reasons, we focus our analysis to the sample of rural households hereafter.

5.1   Estimates and within-sample fit

Because the model's cost function is linear, we are not able to separately identify the mean transportation cost from the mean discount factor. Thus, a normalization is needed. We choose to pick a particular value for the monthly discount factor of low-income mothers and estimate the rest of the parameters of the model. Because these low-income families face important credit constraints, we have assumed a monthly discount rate of 0.98.[28]

In Table 4, we present the SMLE estimates of our structural model. Unlike the parameters of most reduced form models, our estimates have a direct economic interpretation and illustrate how the mothers' home-to-agency transportation costs vary with respect to their own characteristics. For example, the estimated coefficient on distance (0.013) suggests that the opportunity cost of the home-to-agency travel time is close to $0.40 per hour (a little less than one cent per minute).[29] This is a reasonable estimate considering that the Ecuadorian minimum wage in 2004 was close to $1 per hour.

[Please, insert Table 4]

In addition, our results provide evidence that travel costs decrease with age and are somewhat smaller for women who have a partner. Moreover, the coefficients corresponding to the number of rooms and the tenure of a housing unit are both positive and statistically significant, meaning that the opportunity cost of traveling increases with wealth. Finally,

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[28]In 2004, nominal interest rates (including other fees) of consumption credits in Ecuadorian financial institutions averaged 18%. However, most of the low-income households in our sample may not qualify to obtain a loan in the formal financial sector. In the informal sector, they may obtain short term loans that (illegally) charge an average interest rate of 5% per month. For this reason, we think that the corresponding discount factor for this set of households should be relatively low (0.98). The main results of the paper do not change for alternative discount factor assumptions.

[29]Notice that the *distance* variable measures one-way travel time from the individual's residence to the payment agency. Thus, our results suggest that travel time is worth $0.013 for every two minutes, or $0.39 per hour.

the coefficient on the Selben index is negative suggesting that travel costs decrease with higher values of this index. This may seem counterintuitive at first since this index is, by construction, positively associated with income and wealth. However, once we control for the household's housing characteristics, home-to-agency distance, and the other demographic variables included in our specification, there may be other factors that are captured by the Selben index that are negatively related to travel costs. For example, families with a high index value in our sample may be more likely to own a vehicle or to know someone who owns one, and this will certainly decrease their cost of traveling.

To examine the within-sample fit, we use the estimated model to simulate the behavior of the households in our sample and compare it with the observed data. For instance, in the first column of Table 5, we simulate the average number of beneficiaries per month that have accumulated one, two, three and four transfers and compare it with the sample averages which are displayed on the adjacent column. Clearly, the model matches the patterns of the data very well. For example, our model predicts that on average, out of the 970 rural beneficiaries we consider, about 860 have received a transfer one month ago while only 11 have accumulated payments for more than two months. These estimates are quite close to those observed in the data.

To evaluate the model's ability to predict the collection of the subsidy, we simulate the share of individuals that collect it in any given month. First, we compute the percentage of recipients that collect one or more (accumulated) transfers in any given month. We call this estimate the *unconditional* share. Then, we estimate the share of beneficiaries who choose to receive the subsidy among those who have accumulated one, two, three and four transfers, respectively. We refer to these measures as *conditional* shares hereafter. Conditional and

20

unconditional shares are displayed on the third and fourth column of Table 5.

[Please, insert Table 5]

Overall, the model fits the observed conditional and unconditional shares of individuals who receive the subsidy very well. For example, there are virtually no differences between the unconditional predicted and actual share of low-income mothers who receive the transfer. This is also true for most conditional shares. The only relevant difference is related to those households who have accrued three months of payments. In our sample, 85% of those families decided to receive the payment in the current month, and our model overpredicts this number by about six percentage points.

In our view, the within-sample fit described above gives us enough confidence in the model to use it to perform counterfactual experiments to explore the benefits and costs of alternative payment mechanisms.

5.2   Policy experiments

One of the primary benefits of estimating a structural model is that it can be used to conduct counterfactual experiments. In this section, we use our estimated model to estimate the economic value of the program and, also, to evaluate alternative payment options.

According to our model, the average economic value of the subsidy is close to $842 among rural households.[30] Thus, the overall value of the BDH program in Ecuador may be at least $800 million.[31]

The value of the program, of course, increases with the number of payments that house-

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[30]According to our model, the average economic value of the program can be computed as $\bar{W}^*(1)$. This corresponds to the minimum cash amount that recipients would be willing to accept to give up the program.

[31]Because urban households are on average closer to payment agencies than their rural counterparts, we expect that the economic value of the subsidy is higher among these households. Since there are a little more than 1 million of recipients, the overall value of the program should be at least $800 million.

holds are allowed to accrue. For instance, the current program, that allows households to accrue up to four months of payments, is about $5 million more valuable than an identical program with no payment accrual. Increasing the number of periods that households are allowed to accumulate their payments to five or six months, however, does not change the value of the program significantly. This occurs because only a few households with high travel costs are affected by such policy.

We compute another counterfactual that allows us to quantify the household's welfare gains if the government raises the number of payment agencies in rural locations. In particular, we assume that new payment agencies are built such that the home-to-agency travel time of a representative rural household decreases by 60 minutes. In Table 6, we show that such policy increases the value of being enrolled in the program by about 4%. To assess the efficiency of such policy, the Ecuadorian authorities should evaluate both the magnitude of the total benefits (4% increase per household) and the total costs (operating costs of such agencies) involved in such operation.

[Please, insert Table 6]

Finally, the model may also be used to create a differentiated schedule of payments that compensates rural households for their travel time-opportunity costs. That is, the payments could be geographically differentiated so that the total value of the program is the same for every household.[32] We present estimates of this counterfactual experiment in Table 7. This results suggest that rural households located in the Amazon (East) and in the Highlands

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[32]To construct this experiment, we first compute the value of the BDH program for a representative family that has the option to receive $15 per month. The representative family has the mean characteristics of our sample of rural households, except for the home-to-agency travel time. This variable has been set to zero, since we are interested in computing the value of the program for a family that lives in an area with a payment agency. Then, we find the transfer that the average household in each Province should receive to match the value of the program of the former representative family.

should receive between $0.25 and $0.50 higher monthly transfers than their urban counterparts to compensate them for their travel costs. These estimates provide evidence that the costs of collecting the transfer are much lower than the direct expenses of traveling (bus fare plus related opportunity costs).[33] This suggests that there may be complementarities in the activities that rural households carry out when they travel to an urban center. For example, beneficiary households could travel to urban centers to commercialize their agricultural products or to receive health care, and use this opportunity to collect their transfer. An alternative explanation could be that rural beneficiaries often delegate the collection of the subsidy to a third party. These interesting possibilities may be explored in further research.

[Please, insert Table 7]

6 Conclusions

In this paper we have specified and estimated a simple behavioral model that resembles the household's collection decisions of a CCT program in Ecuador. Despite its simplicity, the model replicates the observed data well and may be a powerful tool for designing the delivery of payments of such a program. In addition, the counterfactual experiments suggest that an adequate design of the delivery of payments can substantially increase the value of CCT programs.

In our model, transportation costs are the main source of households' transaction costs. We recognize that there may be other sources of transaction costs that influence the collection's decisions of households. For example, the opportunity cost from waiting in line at the payment agencies and other illegal fees that may be charged at the time of collecting the

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[33] As detailed in footnote 4, the direct expenses of traveling could raise up to $8 for some rural households.

transfer may also affect the value of the program. We emphasize that, with the appropriate data, the model specified in this paper may be a useful benchmark to analyze household's behavior under these circumstances as well.

References

[1] Behrman, J., P. Sengupta, and P. Todd, "Progressing through Progresa: An impact Assessment of a School Subsidy in Mexico," *Economic Development and Cultural Change*, 2005, 54(1), 237-75.

[2] Berkovec, J. and S. Stern, "Job Exit Behavior of Older Men," *Econometrica*, 1991, 59(1), 189-210.

[3] Bourguignon, F., F. Ferreira, and P. Leite, "Conditional Cash Transfer, Schooling, and Child Labor: Micro-Simulating Brazil's Bolsa Escola Program," *The World Bank Economic Review*, 2003, 17(2), 229-254.

[4] Caldés N., D. Coady, and J. Maluccio, "The Cost of Poverty Alleviation Transfer Programs: A Comparative Analysis of Three Programs in Latin America," FCND Discussion Paper No. 174, IFPRI, 2004.

[5] Keane, M. and K. Wolpin, "The Solution and Estimation of Discrete Choice Dynamic Programming Models by Simulation and Interpolation: Monte Carlo Evidence," *Review of Economics and Statistics*, 1994, 76(4), 648-672.

[6] Keane, M. and K. Wolpin, "Career Decisions of Young Men," *Journal of Political Economy*, 1997, 105(3), 473-522.

[7] Keane, M. and K. Wolpin, "The Effect of Parental Transfers and Borrowing Constraints on Educational Attainment," *International Economic Review*, 2001, 42(4), 1051-1101.

[8] León M. and S. Younger, "Transfer Payments, Mother's Income, and Child Health in Ecuador," *Journal of Development Studies*, Forthcoming.

[9] León, M., R. Vos, and W. Brborich, "Son efectivos los programas de transferencias monetarias para combatir la pobreza? Evaluación de impacto del Bono Solidario en el Ecuador," Unpublished manuscript, Sistema Integrado de Indicadores Sociales del Ecuador, Quito, Ecuador, 2001.

[10] Lippman, S., and J. McCall, "The Economics of Job Search: A Survey," Parts I and II, *Economic Inquiry*, 1976, (14), 155-189 and 347-368.

[11] Parandekar, S., "Protecting the Poor in Ecuador: Priorities and Options for the Bono Solidario," in Report No. 19920-EC: "Ecuador Crisis, Poverty and Social Services," Human Development Department, Latin America and the Caribbean Region, World Bank, 2000.

[12] Schady, N. and C. Paxson, "Does Money Matter ? The Effects of Cash Transfers on Child Health and Development in Rural Ecuador," World Bank Policy Research Working Paper No. 4226, 2007.

[13] Rawlings, L. and G. Rubio, "Evaluating the Impact of Conditional Cash Transfer Programs: Lesson from Latin America," World Bank Policy Research Working Paper No. 3119, 2003.

[14] Schady N., and C. Araujo, "Cash Transfers, Conditions, School Enrollment, and Child Work: Evidence from a Randomized Experiment in Ecuador," World Bank Policy Research Working Paper No. 3930, 2006.

[15] Schultz, T., "School Subsidies for the Poor: Evaluating the Mexican Progresa Poverty Program," *Journal of Development Economics*, 2004, (74), 199-250.

[16] Stokey, N., R. Lucas and E. Prescott, "Recursive Methods in Economic Dynamics," Harvard University Press, 1989.

[17] Todd, P. and K. Wolpin, "Using Experimental Data to Validate a Dynamic Behavioral Model of Child Schooling: Assessing the Impact of a School Subsidy Program in Mexico," *American Economic Review*, 2006, 96(5), 1384-1417.

Appendix: Existence and Uniqueness Proof

Because individuals face an infinite horizon and the environment is stationary, the problem is the same at each point in time and we may drop the time subscripts. If a solution exists, the value function $V(a, \varepsilon)$ will satisfy

$$V(a, \varepsilon) = \max_{P \epsilon \{0,1\}} \left\{ P[g(aM - c) + \varepsilon] + \beta E V[f(a, P), \varepsilon] \right\},$$

where $f(a, P) = P + (1 - P) \min\{a + 1, \bar{a}\}$, P is the optimal decision rule, and g is a continuous bounded real-valued function with the following properties: $g' > 0$ and $g'' \leq 0$. Let $X \subset R^2$ and $B(X)$ be a space of bounded functions $f : X \to R$ and the metric is given by the sup norm. Let $T : B(X) \to B(X)$ be an operator such that

$$T\varphi = \max_{P \epsilon \{0,1\}} \left\{ P[g(aM - c) + \varepsilon] + \beta E \varphi[f(a, P), \varepsilon] \right\}, \qquad \varphi \epsilon B(X).$$

To prove that the value function V exists and that is unique, we first show that the mapping T is a contraction. If T is a contraction, the Contraction Mapping Theorem (Stokey et al. 1989, Theorem 3.2) states that T has exactly one fixed point.

To prove that T is a contraction, we show that Blackwell's sufficient conditions are satisfied (Stokey et al. 1989, Theorem 3.3):

a) (monotonicity): if $\varphi \leq \psi$, then $T\varphi \leq T\psi$ for all $\varphi, \psi \epsilon B(X)$;

b) (discounting): there exists some $\beta \epsilon (0, 1)$ such that $T(k + \varphi) \leq \beta k + T\varphi$, for all $k > 0$ and $\varphi \epsilon B(X)$.

Proving that condition (a) holds is straightforward: if $\varphi(a, \varepsilon) \leq \psi(a, \varepsilon)$ for all values of a and ε, then the objective function for which $T\psi$ is the maximized value is uniformly higher than the function for which $T\varphi$ is the maximized value. To show that condition (b) holds, let us compute

$$
\begin{aligned}
T(k + \varphi) &= \max_{P \epsilon \{0,1\}} \left\{ P[g(aM - c) + \varepsilon] + \beta E \left(\varphi[f(a, P), \varepsilon] + k \right) \right\} \\
&= \max_{P \epsilon \{0,1\}} \left\{ P[g(aM - c) + \varepsilon] + \beta k + \beta E \left(\varphi[f(a, P), \varepsilon] \right) \right\} \\
&= \beta k + \max_{P \epsilon \{0,1\}} \left\{ P[g(aM - c) + \varepsilon] + \beta E \left(\varphi[f(a, P), \varepsilon] \right) \right\} \\
&= \beta k + T\varphi.
\end{aligned}
$$

Hence, Blackwell's conditions are satisfied and T has a unique fixed point. QED.

Table 1: Geographical distribution of beneficiaries and payment agencies of the Bono de Desarrollo Humano in 2004

		Agencies from Banred		
Province	Number of Beneficiaries	Total number of payment agencies[a]	Share of *Parroquias* (a smaller geographic region) with a payment agency [b]	Share of beneficiaries that reside in a *Parroquia* with a payment agency
Azuay	47,486	15	0.04	0.28
Bolivar	25,418	2	0.06	0.31
Cañar	18,381	8	0.06	0.28
Carchi	13,589	5	0.11	0.42
Chimborazo	48,758	4	0.06	0.31
Cotopaxi	38,261	7	0.09	0.30
El Oro	49,221	20	0.14	0.73
Esmeraldas	38,967	7	0.06	0.48
Francisco De Orellana	8,875	2	0.06	0.42
Galapagos	340	2	0.25	0.71
Guayas	271,156	46	0.39	0.75
Imbabura	36,476	8	0.08	0.47
Loja	46,428	9	0.08	0.37
Los Rios	66,533	20	0.17	0.64
Manabi	148,581	19	0.12	0.52
Morona Santiago	9,500	2	0.03	0.20
Napo	7,922	2	0.05	0.38
Pastaza	5,011	5	0.05	0.41
Pichincha	123,500	55	0.41	0.79
Sucumbios	13,244	4	0.03	0.33
Tungurahua	41,601	9	0.08	0.36
Zamora Chinchipe	9,222	2	0.06	0.03
Other	1,571	3	0.25	0.51
Total	1,070,041	256	0.13	0.56

Notes:

The information displayed on this table was tabulated using the universe of the payment data collected by BANRED.

We thank Miguel Acosta from the Banco Central del Ecuador for sharing this information with us.

[a] To identify payment points, we select those bank agencies with an average of 20 or more transactions per month.

[b] According to the Ecuadorian 2000 Census, there are 1149 *Parroquias* in Ecuador.

Table 2: Descriptive Statistics
Number of observations: 2523

Variables	Mean	Std. Dev.	Min.	Max.
Number of payments : Number of times that the subsidy was collected from January to December 2004	11.04	1.53	4	12
Distance : Travel time (minutes) from center of the Parroquia where beneficiaries reside to the closest point where they can collect the transfer	15.20	19.95	0	118.18
Urban : Takes the value of one if beneficiary resides in an Urban Area (as defined by the Ecuadorian 2000 Census)	0.62	0.49	0	1
No education : One if beneficiary has not received any type of formal education	0.09	0.29	0	1
Age : Age (in years) of beneficiary	32.36	8.13	14	61
Family partner : Equals to one if beneficiary has a partner living at home	0.75	0.44	0	1
Children : Number of living children	3.51	2.16	0	13
Rooms : Number of rooms in housing unit	1.05	0.86	0	5
Tenure : Equals to one if individual owns the housing unit where she resides	0.18	0.38	0	1
Selben index : Selben proxy-means index	40.62	6.36	12.88	50.64

Table 3: Linear Regressions
Dependent variable: Number of times that the subsidy was collected in 2004

Number of observations: 2,523
White - Robust Standard errors in parenthesis

Independent Variables	Model			
	(1)	**(2)**	**(3)**	**(4)**
Constant	11.079 ***	11.353 ***	10.494 ***	11.282 ***
	(0.073)	(0.424)	(0.493)	(0.510)
Distance	-0.021 ***	-0.020 ***	-0.019 ***	-0.019 ***
	(0.003)	(0.003)	(0.003)	(0.003)
Urban	0.245 ***	0.241 ***	0.031	-0.024
	(0.084)	(0.085)	(0.088)	(0.091)
Urban x Distance	0.017 ***	0.017 ***	0.017 ***	0.017 ***
	(0.004)	(0.004)	(0.004)	(0.004)
Age		-0.023	-0.014	-0.030
		(0.026)	(0.026)	(0.026)
Age^2		0.001	0.000	0.001
		(0.000)	(0.000)	(0.000)
No education		-0.137	0.000	0.030
		(0.113)	(0.118)	(0.121)
Has a partner		0.078	0.121 *	0.108 *
		(0.067)	(0.067)	(0.065)
Number of children		-0.041 **	0.007	0.009
		(0.019)	(0.021)	(0.021)
Number of rooms in housing unit			-0.173 ***	-0.095 **
			(0.038)	(0.040)
Housing unit tenure (One if owns)			-0.459 ***	-0.297 ***
			(0.101)	(0.112)
Selben index			0.022 ***	0.014 **
			(0.006)	(0.006)
Region Fixed Effects (21)	No	No	No	Yes
R-squared	0.085	0.089	0.113	0.170

Note: Coefficients of the dummy variables for areas are not reported
*   : Statistically significant at the 10% level
** : Statistically significant at the 5% level
*** : Statistically significant at the 1% level

Table 4: Structural Estimates

Description	Coefficient	Std. Dev.
C_0 : Constant	-0.823 ***	(0.262)
C_1 : Distance	0.013 ***	(0.002)
γ_1 : Age	-0.009 **	(0.004)
γ_2 : Age^2	0.000	(0.000)
γ_3 : No education	-0.127 **	(0.059)
γ_4 : Has a partner	-0.070	(0.046)
γ_5 : Number of children	-0.014	(0.010)
γ_6 : Number of rooms in housing unit	0.115 ***	(0.029)
γ_7 : Tenure	0.377 ***	(0.080)
γ_8 : Selben index	-0.026 ***	(0.006)
σ_ε : Standard deviation of ε	1.706 ***	(0.315)
σ_u : Standard deviation of u	0.036	(0.038)

The data consists of a panel of 970 rural households over 12 months. The corresponding sample size is 11,040. The discount factor β has been normalized to 0.98. Standard errors in parenthesis. *, **, and *** denote statistical significance at the 10, 5, and 1 percent level, respectively.

Table 5: Within sample fit

	Mean number of beneficiaries per month		Share of beneficiaries that collect the transfer(s) in any given month*	
	Model	**Sample**	**Model**	**Sample**
Overall (*unconditional*)	970.0	970.0	88.7%	88.7%
Months since last payment (*conditional*)				
One	860.6	859.9	88.5%	88.4%
Two	98.7	100.0	89.9%	91.3%
Three	9.9	8.8	91.1%	84.8%
Four	0.9	1.3	100.0%	100.0%

* The *unconditional* share measures the percentage of recipients that collect one or more transfers in any given month. The *conditional* shares refer to the percentage of beneficiaries who choose to receive the subsidy among those who have accumulated one, two, three and four transfers, respectively.

Table 6: Economic value of the subsidy if home-to-agency travel time decreases by 60 minutes*

Travel time to closest town with payment agency (in minutes)	Economic value of the subsidy for a representative rural household ($)	Percentage increase in program's value when travel time decreases
120	791.1	3.8%
90	805.4	3.9%
60	820.8	4.1%

* These are estimates for a representative rural household. The observed characteristics correspond to the mean of our sample with the exception of the home-to-agency travel time.

Table 7: Differentiated transfers in rural areas to compensate households for their travel costs [*]

West (*Costa*)		Highlands (*Sierra*)		East (*Oriente*)	
Province	**Monthly transfer ($)**	**Province**	**Monthly transfer ($)**	**Province**	**Monthly transfer ($)**
El Oro	14.94	Azuay	15.13	Morona Santiago	15.45
Esmeraldas	15.05	Bolivar	15.57	Napo	15.44
Guayas	15.06	Cañar	15.38	Pastaza	15.65
Los Rios	15.06	Carchi	15.03	Zamora Chinchipe	15.47
Manabi	15.33	Chimborazo	15.29	Sucumbios	15.39
		Cotopaxi	15.65	Francisco De Orellana	15.26
		Imbabura	15.15		
		Loja	15.46		
		Pichincha	15.14		
		Tungurahua	15.13		

Notes:

[*] To construct this experiment, we first compute the value of the BDH program for a representative family that has the option to receive $15 per month. The representative family has the mean characteristics of our sample of rural households, except for the home-to-agency travel time. This variable has been set to zero, since we are interested in computing the value of the program for a family that lives in an area with a payment agency. Then, we find the transfer that the average household in each Province should receive to match the value of the program of the former representative family.