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Crisis, Food Security, and Conditional Cash Transfers in Nicaragua

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Nicaragua's Red de Protección Social (RPS), is part of a wave of conditional cash transfer programs that provide substantial cash payments to households if certain requirements are met such as school attendance, visits to health care facilities, and participation in nutritional seminars. Utilizing the experimental design of RPS we test the impacts of the program on food expenditures and variety in consumed food bundles by examining the influences of initial poverty and an exogenous shock to coffee prices on coffee producing communities. Through cash payments, RPS was able to increase food consumption and variety. Additionally, nutrition education programs provided by RPS appear to have been successful, as household expenditure share on food increased (although not significantly), while Engel's law suggests that food share should decrease with a conditional cash monetary transfer. Results also show that coffee price shocks tended to decrease both the variety and expenditures on cereals and vegetables. Moreover, the shock to coffee prices seems to have had a greater impact on the consumption of households relatively better off pre-program. Finally, RPS impacts on food security appear to remain constant across households even when there are differences in initial poverty or the exogenous shock to coffee prices.

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Introduction:

The Red de Protección Social (RPS) in Nicaragua is just one of a wave of conditional cash transfer (CCT) programs implemented throughout Latin America (Oportunidades in Mexico, Bolsa Familia in Brazil, and PRAF in Honduras). These programs provide substantial cash payments to households if certain requirements are met, in particular child school attendance and visits to health care facilities (Rawlings and Rubio, 2005). In addition, households are required to attend health care seminars that teach mothers about nutrition and child care practices. Poor households targeted by these programs have utilized these payments to increase household food expenditures as evident by previous RPS impact evaluations (Maluccio and Flores, 2005) as well as PROGRESA -a similar Mexican program on which it was based-) evaluations (Hoddinott and Skoufias, 2004). [i]

Previous evaluation of RPS have shown that program impacts on school enrollment and expenditures can be influenced by economic shocks and pre-program poverty (Gitter and Barham (2008); Dammert (Forthcoming); Maluccio (2005)). Although poverty status is used to determine eligibility, the sizes of the cash payments have not been linked to observable economic shocks or initial poverty status. De Janvry and Sadoulet (2006) suggest that program efficiency of CCTs could be improved if payments were linked to observable events and characteristics such as shocks and poverty status.

This paper's contribution is to test the efficacy of CCTs at maintaining food security during an economic shock. Specifically, we examine the effects of a shock to coffee prices that impacted one half of the communities in our sample during RPS implementation. This crisis led to declines in total consumption of around 20% (Maluccio, 2005). Although previous studies (Maluccio, 2005; Gitter and Barham, Forthcoming; De Janvry et al. 2006) have examined the influence of shocks on the impacts of conditional cash transfers on schooling and total

expenditures, this paper's contribution is its focus on food expenditures and variety by food groups.

The RPS evaluations cited above focus on school enrollment and total food expenditure, but the makeup of a child's diet is also a key factor in his or her development. This is particularly the case when economic shocks threaten food security. The well developed literature on the relationship between diet and health is discussed in depth in section 2. The remainder of the paper is organized as follows: Section 3 describes the RPS program and data in greater detail and provides descriptive statistics. Section 4 provides the econometric specification used, section 5 presents results of the analysis and section 6 presents conclusions.

Section 2: Literature

In order to understand how a conditional cash transfer program might impact diet during a crisis, we examine 3 relevant lines of literature. The first one focuses on the conceptual context behind CCTs, the second one on the role of shocks and food security, and the final one is a summary of relevant CCT evaluations.

The Context of Conditional Cash Transfers

Poverty is a major cause of hunger. CCTs programs such as RPS and PROGRESA address this problem by providing substantial cash payments (20% of household income) to households to lift them out of poverty (Maluccio and Flores, 2005). One goal of these cash payments is to increase food consumption thereby increasing the human capital of the children and adults within the household.[ii] Although payments were not explicitly required to be spent on

food, households chose to buy food with a large majority of the payments received (Maluccio and Flores, 2005).

There is a strong relationship between poverty status measured by per capita expenditures, food security, and malnutrition. Low income families have difficulties acquiring sufficient amounts of the macronutrients and micronutrients needed to support human development. Often poor households have limited diets consisting mainly of starchy foods, with little in the way of animal products, vegetables and fruits (UN. Hunger Task Force report, 2005). Such deficits result in malnourished children who find their physical and mental development greatly jeopardized. (Ray, 1998; Bennett 2003; Kadiyala 2006). However, food alone does not guarantee improved nutritional status as systematic reviews show that food based intervention alone has little measurable impact on nutritional status, morbidity and mortality levels except in crisis situations (Clay and Stokke 2000).

One reason cash or food transfers can be insufficient to improve nutrition is that households may not have a complete understanding of how best to allocate their household's food budget to include more nutritious foods that improves child health. To address this problem both RPS and PROGRESA included health seminars that teach mothers how best to allocate their food budgets and promote child care practices. Although not a direct test of these seminars, one way to evaluate their impact is to examine the changes in the share of food budget. If the program did not change household preferences on food purchases, then the household budget share should be consistent with Engel's Law, which posits that as households get richer they typically spend a lower percentage of their budget on food (Engel 1857). Maluccio and Flores (2005) and Hoddinott and Skoufias (2004) show respective increases in the budget share on food for RPS and PROGRESA, yet these households received a cash stipend, which we would expect

from Engel's Law to decrease their food budget share. This result leads both studies to conclude this could be a sign of the non-income impacts associated with the education component of the nutrition seminars.

The Importance of Food Security

The name RPS translates to "the social safety net." As the name suggests, this program is not only designed to lift poor households out of poverty, but also to mitigate the long term consequences of negative economic shocks by providing a safety net. One problem with negative economic shocks is that they can create or exacerbate existing food insecurity. Food security exists "when all people at all times have both the physical and economic access sufficient to meet their dietary needs in order to lead a healthy and productive life" (USAID 1992). Food security encompasses three equally important dimensions: availability, access and utilization of food. When poor households are hit by crisis, all three of the above dimensions of food security may be suppressed. Empirical evidence shows that when crises of different types take place, vulnerable households often undertake short-term risk coping strategies in order to smooth food consumption, which oftentimes put them in a more vulnerable position with regard to longer-term livelihood options (Arrow 1964, Paxson 1993; Skoufias and Quisumbing 2005). The longer a household is exposed to a crisis and the lower the level of reversibility of the risk coping strategy it undertakes, the more vulnerable this household finds itself in the event of a new crisis. As empirically studied by Maxwell (1995), examples of those risk coping strategies include, among others, short term dietary changes -for example, eating foods that are less preferred but often less expensive but roughly comparable, at least in terms of energy-; reducing or rationing food consumption –for example, limiting portion size or skipping meals-; altering intra-

household distribution of food; depletion of stores; borrowing food or money to buy food; increased use of credit for consumption purposes; increased reliance of wild food, short-term migrations, short-term alterations in crop and livestock production patters, pledging, sales of assets, etc.

There exist several measures of food security which can help researchers identify food insecurity and assess the severity of food shortfalls, and in particular the impact of seasonal and chronic crises on household food security. The same indicators can be used to analyze the effectiveness of interventions such as RPS. Examples of the most common measures include collecting and analyzing household food expenditures data over a few weeks (as RPS did) and 24-hour recalls of food consumption for individual members of a householdSince both methods have advantages as well as drawbacks (Maxwell, 1995), other researchers use alternative measures such as food balance sheets, rainfall and marketing data and even anthropometric measurement. Finally, expenditure or income measures may also help identify the food insecure. Households with sufficient income or savings may be able to smooth consumption during economic shocks, while already poor households may have to cut expenditures further or undertake risky risk coping strategies.

In the area covered by RPS in rural Nicaragua, malnutrition and food insecurity were already a problem before the intervention. In 1998, two years before the program, a World Bank study showed that 42% of households in the surveyed communities had total household expenditures below the amount required to purchase the food sufficient for minimum caloric requirements (World Bank, 2003). This same poverty measure is used in the next section to identify household before the crisis that were already at risk, and to examine how they cope with a negative shock as well as how they respond to receiving a cash transfer.

Relevant Conditional Cash Transfer Evaluations

In an initial impact evaluation of RPS, Maluccio and Flores (2005) found that the program resulted in an average net increase of 650 Nicaraguan Córdobas in annual per capita food expenditures and an improvement in the diet of beneficiary households by increasing consumption of more nutritious food groups like fruits, milk, and vegetables, which was similar to the 20% increase in consumption from the transfer. Similarly, when analyzing the impact of PROGRESA - a similar Mexican CCT-, on food consumption, Hoddinott and Skoufias (2005) found that beneficiary households in treatment localities obtained 6.4% more calories than did comparable households in control localities, especially from vegetable and animal products.

Our work extends this evaluation literature by examining the impact of CCTs in the context of the nutrition literature. We focus not only on total expenditures, but also on variety of food consumed and examine both measures by specific food groups. An additional factor was an exogenous decline in world coffee prices that affected about one-half of the communities (Maluccio, 2005). The control coffee communities in the RPS sample experience a 27% drop in total expenditures between 2000 and 2002, a similar decline was seen in the treatment communities after accounting for the RPS transfer.

Section 3: Econometric Specification and Difference-in-difference

One of the main reasons evaluations of conditional cash transfer programs are so popular among researchers is that randomized control and treatment groups were created as part of their implementation. In order to estimate the impact of RPS it is important to have similar control and treatment groups with both pre and post program data. As Maluccio and Flores (2005) point out, randomization in the RPS program appears to have been effective and contamination between control and treatment groups was minimal. In Section 4 we show that not only are control and treatment groups similar as a whole, but the two groups are still similar when compared across a number of independent variables, including pre-program poverty status and coffee versus non-coffee community.

The availability of both ex-ante and ex-post observations of control and treatment groups allows for the "gold standard" measure of difference-in-difference (DID) to estimate program impacts (Schultz, 2004; Hoddinott and Skoufias, 2004; Parker and Skoufias, 2001). We begin with a relatively simple DID framework to measure program impacts on food expenditures and diversity. We then add to this framework to measure the impact of RPS by the presence of the exogenous shock to coffee prices and different strata of baseline consumption.

Maluccio and Flores (2005) provide a basic difference-in-difference equation to measure program impacts. In this case household food expenditures or diversity E_{hct} is the dependent variable, for household (h), community (c), and time (t). As described in the previous section we measure program impacts of per capita expenditures for 7 food categories along with the diversity of food items consumed. The simplest specification of independent variables for the DID estimation is $E_{ict} = \alpha_0 + \alpha_1 Year + \alpha_2 RPS_c + \delta_1 RPS_c * Year + \mu_{ic} + \nu_{ict}$ (1)

E_{ict} = Household expenditures for household i, in community c, at time t.

RPS_c = (1) if community c is eligible for RPS

Year = (1) if year equals 2002

μ_{ic} = time invariant error term

v_{ict} = time variant error term

The equation includes indicator variables for being in the intervention group (RPS_c) along with a year variable (Year) that measures the difference in the outcome between baseline and ex-post (Year =1) in the control group. The coefficient on the variable RPS, α_2, measures the time invariant difference between control and treatment groups. Finally the term δ_1 measures the program's impact, as it is the coefficient on households in treatment communities in the ex-post observation year. The two error terms are: μ_{ic}, which captures all (observed and unobserved) household (or individual) level time-invariant factors and $v_{ict,}$ which captures the unobserved idiosyncratic household (or individual) and time-varying error. We use a slightly modified form of difference-in-difference. Difference-in-difference is typically used when there are initial differences between control and treatment group. In the case of RPS there were few differences and most were not substantial or statistically significant. Another way to estimate the program's impact would be to use a reduced form equation to estimation the change in the outcome of interest. In other words the dependent variable becomes the difference between the observations in 2002 and 2000 ($E_{ic,change} = E_{ic02} - E_{ic00}$). In the reduced form the change $E_{ic,change}$ in the variable of interest is estimated using the treatment variable *RPS* and a constant term. This form has the advantage of controlling for time-invariant household characteristics. This form is utilized in the descriptive statistics section to estimate basic impacts of the program. The simplified equation has the advantage of eliminating the need for multiple interaction terms, which will be required as we test RPS impacts in light of consumption groups and shocks.

$$E_{ic,change} = \alpha_0 + \delta_1 RPS_c + \mu_{ic} \quad (2)$$

The next step is to expand the basic estimation equation to examine the impacts of an exogenous shock to coffee price. As is the case with the expenditure groups, the shock is measured by a dichotomous dummy variable where Coffee equals 1 if the community farmed coffee. Thus to estimate the change in expenditure or variety $E_{ic,change}$ we include the variable Coffee along with its interaction with RPS. In this case the α_1 coefficient indicates the difference between those with and without the shock. It is importance to distinguish the RPS impact measures. First is the measure of the impact of RPS for non-coffee communities, $\delta_{1,}$. For coffee farming communities who experienced the crisis the total impact of RPS is $\delta_1 + \delta_2$. Finally, the difference in impacts of RPS between coffee and non-coffee communities is δ_2..

$$E_{ic,change} = \alpha_0 + \alpha_1 Coffee + \delta_1 RPS_c + \delta_2 Coffee*RPS + \mu_{ic} \quad (3)$$

$Coffee_{ct}$= (1) if household was in locality that farms coffee

The second modification to the basic equation is made to test the impact of baseline consumption on program impacts. The sample was divided into three groups based on initial poverty level based on a national poverty (moderately poor) and extreme poverty line (poor) measure. To test the impact of being in one of these three consumption categories (poor, moderately poor, and non-poor) we utilize equation (3) below. The coefficients α_1 and α_2, measure the impact on the change in the food expenditure of being in the "poor group" (P =1) and the moderately poor group (MP =1), with the non-poor group being omitted. Now in addition to $\delta_{1,}$ the impact of RPS on food expenditure, equation (3) also estimates the effect of

being poor or moderately poor on RPS impacts, via the coefficients δ_2 for poor, and δ_3 for MP respectively, as follows. Similar to the previous equation $(\delta_1 + \delta_2)$ is the total impact of RPS for poor households, while $(\delta_1 + \delta_3)$ is the total impact for moderately poor households.

$$E_{ic,change} = \alpha_0 + \alpha_1 P + \alpha_2 MP + \delta_1 RPS_c + \delta_2 RPS_c * P + \delta_3 RPS_c * MP + \mu_{ic} \qquad (4)$$

In this section we have presented two equations, equations (3 and 4), which test RPS's impacts in light of two factors: household consumption and exogenous shocks. Another important question is how do these factors interact? For example are households with higher incomes better able to smooth consumption? To answer these questions we provide separate estimates of the impact of economic shocks by poverty group. Those interactions along with the results of the equations shown in this section are provided in the results section. Finally, we note that errors are clustered at the community level to control for correlation in the error term within a community.

Section 4: Program and Data Description:

Following poverty based geographic targeting criteria, two departments in the Northwestern part of Nicaragua were chosen to implement the RPS pilot phase, where 21 communities were randomly selected as beneficiaries (i.e. the intervention group) and 21 communities in the same region were designated as the control group. Three rounds of surveys were conducted among 1300 households of those 42 communities, one in year 2000 –before the program was implemented- and two surveys during the program in 2001 and 2002. [iii] We utilize a subsample of these households which include those with of age eligible children.

As shown in Table 1, the average household received C$ 3,885 ($302), or about 18% of total annual household consumption expenditures. This consisted of two parts. First, RPS beneficiaries received a C$ 2,880 ($224) annual food security transfer.[iv] It is worth noting that although it was called a food security transfer no direct conditions were placed on how household spent it (the conditions of the program are detailed below). Moreover, households with children ages 7-13 who had not completed the fourth grade were eligible for a bi-monthly transfer for school attendance of C$ 1,440 per year and an additional C$275 for school supplies.

Table 1: Program Benefits

	PROGRAM COMPONENTS	
	Food security, health and nutrition	**Education**
Eligibility	All households	All households with children from 7-13 who have not completed 4th grade of primary school
Demand benefits: Monetary transfers	Food security transfer C$ 2880 /year per households ($224)	Transfer to attend school C$ 1440 /year per household ($112) Transfer to purchase school supplies C$275 per child at the beginning of year ($21)
Supply benefits *Services and monetary transfers*	*Bimonthly health workshop* *Child growth monitoring* -Monthly (0-2 years) -Bimonthly (2-5 years) Provision of anti-parasite, vitamins and iron supplements. Vaccinations (0-5 years)	Teacher´s transfer C$60/year per child for teacher ($5)

Source: Adapted from Maluccio (2005)

In order to receive the above mentioned benefits, households were required to comply with the following beneficiary co-responsibilities where applicable:

- Attend bimonthly health education workshops.
- Bring children younger than 5 years old to prescheduled health care appointments (on a monthly basis for 0-2 years old and every two months for 2-5 years old children).
- Adequate weight gain for children younger than 4 years.
- Up-to-date vaccination for all children under 5 years.
- Ensure school enrollment and 85% attendance rate for those children between 7 and 13 years old that had not completed 4th grade of primary school.
- Promotion at end of school year.

To encourage food expenditures, cash payments from RPS were given to women as they are more likely to spend their income on children's food (Thomas, 1990; Schultz, 1990). The combination of factors seems to have been extremely effective as Maluccio and Flores (2005) find that reported spending on food increased about as much as the size of the transfer after the implementation of RPS. Furthermore, Gitter and Barham (2008) show that targeting to women was effective at increasing food expenditures for all households, not just ones where women had the potential to bargain for more resources, suggesting that the receipt of the transfer may have empowered women.

Two main variables are used to measure household food consumption: per capita food expenditures and food variety, measured as the number of unique food items consumed. It is worth noting that, since many households in the sample produced food for self consumption, the expenditure data includes the value of this food based on local prices and self-reported value. The second variable of interest is the number of unique food items consumed in the household as a measure of food diversity. [v]

Below Table 2 shows descriptive statistics for the two main dependent variables for treatment and control groups. The first two columns show the baseline consumption for treatment and control groups. The quality of the random assignment of the communities is verified in that the baseline difference between treatment and control is not statistically significant for food expenditures or diversity. The final column provides a difference-in-difference (DID) estimate of program impacts using equation 2, outlined in the previous section. The DID estimates show that RPS led to increases in both per capita food consumption and variety. When taking into account the change of these two food security indicators in the control group, we can see that the net impact of the program on total food expenditures amounted to 648 C$ and the net impact of the program on the number of unique foods consumed by the household between 2000 and 2002 amounted to 4.2, almost a 33% increase.

As an intervention which aims at reducing poverty, it is important to explore if the program had a differential impact across baseline consumption groups. In order to do so, households were divided by initial baseline consumption into three groups based on the National poverty and extreme poverty line: poor, moderately poor, and non-poor (World Bank, 2003). Poor households were defined as those whose total expenditures (including own production) were less than the necessary amount needed to purchase subsistence amounts of food. The other two categories were linked to a national poverty line.[vi]

Table 2 presented below shows total food expenditures as well as food diversity baseline and follow up level across consumption groups. Again it is worth noting that none of the baseline differences within consumption groups are statistically significant between control and treatment groups. Overall the poor and moderately poor saw similar increases in expenditures and diversity, while the non-poor saw larger increases in expenditures and small increases in food

diversity, although in the next section we show that the magnitude of RPS impacts is not significantly different between groups.

Table 2: Per Capita Food Expenditures by Initial Poverty Status and RPS Treatment

		2000 control	2000 treatment	2002 control	2002 treatment	DID-2000 to 2002
Total	**Per capita food expenditure**	2345 (1776)	2319 (1557)	1735 (1232)	2361 (1393)	652**
	Food diversity	11.4 (5.2)	11.7 (5.2)	12.5 (4.9)	17.3 (6.0)	4.5**
Poor	**Per capita food expenditure**	1291 (491)	1278 (466)	1548 (1107)	2295 (1591)	760**
	Food diversity	9.3 (3.2)	9.6 (3.5)	11.5 (4.4)	16.0 (4.6)	4.26**
Mod.Poor	**Per capita food expenditure**	2687 (696)	2638 (779)	2374 (1517)	2958 (1587)	634**
	Food diversity	12.3 (4.1)	12.5 (4.7)	13.3 (4.5)	18.4 (6.0)	4.9**
Non poor	**Per capita food expenditure**	5163 (1940)	5193 (2022)	3405 (2634)	4304 (2896)	869**
	Food diversity	15.4 (7.0)	16.8 (7.4)	15.0 (5.1)	18.6 (6.2)	2.21***

** indicates statistical significance at the 1% level

Besides looking at the aggregate figures, in order to explore if there was a substantial change in the quality of food purchased by beneficiary households Table 3 below shows the change in food expenditures and food diversity by seven different food groups. As Table 3 shows, the program had a positive and significant effect on several food groups (both from an expenditure and diversity perspective). The food categories which experienced the highest impact were dairy products, animal products (such as meat, fish, eggs, etc), fats, fruits and

vegetables. These changes are very relevant given that a more varied diet is associated with a number of improved outcomes such as birth weight (Rao et al. 2001) and child anthropometric status (Onyango et al 1998; Hatloy et al. 2000)). It is also worth seeing that despite an increase in total consumption on the order of 20% (Maluccio and Flores, 2005), cereals did not significantly increase, suggesting that their budget share is decreasing. This is also a good outcome because cereals are typically considered a less nutritious food than animal products, fruit or vegetables as discussed previously in Section 2.

Table 3: Household food expenditures and diversity by food groups and by program group

	DID (02-00) Household Expenditures	**DID (02-00) Household Diversity**
Cereals	72	0.47 ***
Lentils and pulses	37**	0.013
Dairy products	118***	0.46 ***
Animal products	79***	0.69 **
Fats	44 ***	0.11 **
Fruits	36***	0.49 **
Vegetables	73***	1.14 **

\ *** indicates statistical significance at 1% level, ** 5%

In addition to the program, some households in the sample suffered from an exogenous shock to coffee prices during the same period, which led to substantial declines in food and total consumption coffee producing areas in the RPS sample. As Maluccio (2005) notes, exactly one-half of the communities were involved with coffee production (21) with 11 and 10 of the coffee communities in the treatment and control group respectively. The shock began in 2000 with a 50% decline in coffee prices, and was followed by a slight decline in 2001 (Maluccio, 2005). In 2002 prices recovered to their 2000 levels, but were still only 1/3 of their peak in 1997. In response to the price decline, coffee production in Nicaragua fell by 1/3 between 2000 and 2001, and then increased modestly in 2002. Households involved in coffee production or coffee wage

labor were mostly located in communities that reported they were coffee farming communities. However, limited information on labor participation and activity in the survey makes it difficult to identify all households that participated in coffee production. Therefore, a household is considered to have experienced the coffee price shock if it resides in a community that farmed coffee.

Below Table 4 shows the impact of the shock to coffee prices on the two main studied dependent variables: per capita food consumption and the number of unique food items consumed at the household level. The impact of the shock is evident in the decline in food consumption in coffee farming communities. Among households not receiving transfers, those in the coffee growing communities saw their per capita food consumption fall over 30% between 2002 and 2000, while those in non-coffee communities experienced a 10% decline. Among the treatment group, households in coffee-producing communities saw their consumption decline by just 10%, while households in non-coffee communities saw a net 10% increase in consumption. On the other side, the effect of the shock on food diversity was not as substantial in terms of differences between coffee and non-coffee communities. Finally, there do not appear to be substantial differences in RPS impacts between coffee and non-coffee communities; this result is borne out in next section.

As mentioned above in section 2, one way to indirectly test for the impact of a CCT on food preferences through the nutrition seminars is to see if beneficiary households behave consistently with Engel's law, which predicts the share of income spent on food to decrease when income increases . Results show that with the cash transfer the percentage of the budget spent on food increased in treatment communities, while it declined in control communities without an apparent relationship to the shock.

Table 4: Dependent Variables by Coffee and Non-Coffee Communities

		2000		2002		
		Control	Treatment	Control	Treatment	DID
Per Capita Food Consumption	No Coffee	2156	2318	1861	2648	626**
	Coffee	2528	2321	1613	2092	686**
	Total	2345	2319	1735	2361	652**
# of Unique Food Items	No Coffee	10.9	12.1	12.9	17.7	3.6**
	Coffee	11.9	11.4	12.2	16.9	5.3**
	Total	11.4	11.7	12.5	17.3	4.5**
% of Budget Spent on Food	No Coffee	72.6%	71.6%	68.7%	71.2%	3.5%
	Coffee	71.0%	71.4%	67.6%	72.2%	4.2%
	Total	71.8%	71.5%	68.2%	71.7%	3.8%#

Section 5: Results

In this section we present four sets of results, which measure RPS impacts. The first two examine total food consumption and variety program impacts based on (1) initial poverty level and (2) initial poverty level and the coffee price shock. The final two results examine program impacts on specific food groups based on the coffee price shock for (3) per capita consumption and (4) variety.

The first set of results in Table 5 measures the impact of RPS based on 3 baseline consumption levels: poor, moderately poor, and non-poor. The results add to the descriptive DID

by examining the change over time for all three groups in both control and treatment. These results show that RPS increased per capita food consumption and variety, however the impacts of RPS did not vary based on initial consumption levels. The second set in Table 6 measures the effect of the coffee price shock on food consumption per capita and variety, separately for each of the three initial consumption levels. The coffee price shock appears to have negatively impacted the moderately poor and non-poor the most in terms of food diversity and less so for per capita food budget. Finally Tables 7 and 8 measure the impact of the coffee price shock on different food categories using the same measures of per capita food consumption and variety, as measured by the number of unique food items consumed. Coffee price declines negatively impacted variety and per capita expenditures of cereals and vegetables in both treatment and control communities, likely due to the negative impacts on household income. There is also some evidence that coffee price declines led households to substitute fats for other animal products. Finally, RPS increased per capita consumption of fruits and vegetables and the number of unique dairy, animal products, fruits, and vegetables. However, RPS impacts did not differ substantially between coffee and non-coffee communities, except for larger increase in fat expenditures in coffee communities than non-coffee communities, which were substituted for more expensive animal products such as meat.

Table 5 examines the impact of RPS on food consumption and variety based on initial consumption levels, with non-poor household being the omitted group. The first variable of interest is the program's total impact (RPS = 1), for non-poor households in RPS treatment communities. The dependent variables of interest measure the change between the initial pre-program level and the second program year of 2002. Similar to the descriptive analysis in Table 2, RPS is found to increase per capita food consumption by just over $C 1,000 per person,

although this impact is only significant at the 10% level. Similarly it led to an increase of 3.5 unique food items, representing a substantial gain from an initial level of around 11.5 items per household.

The *RPS* variable is also included in the total impact of the program for poor and moderately poor household, with total program impacts [*RPS* + RPS*Poor2000] and [*RPS* + *RPS*Moderately Poor 2000*] for the two groups respectively. In this case, total program impacts appear to be the same for all three income groups, as indicated by the non-significant coefficients on the interaction terms between poverty groups and RPS (*RPS*Poor 2000* and *RPS*Moderately Poor 2000).* This result is also consistent with the descriptive analysis results showing that RPS impacts were not substantially different for the three poverty groups.

There is one key observable difference between initial poverty groups, that is the change in per capita food consumption from 2000 to 2002 which was $C 2700 higher for poor households (*Poor) and* $C 1800 for moderately poor households (*Moderately Poor 2000*) compared to the change of non-poor households. This is not to say that poor and moderately poor households gained, but lost less relative to their non-poor counterparts. Similarly poor households saw a larger increase in the number of unique food items than moderately poor and non-poor households.

Finally Table 5, examines the change in the percentage of the budget spent on food. Typically, as theorized in Engel's Law, this percentage declines as incomes increases. RPS provided cash transfers that increased total income household consumption. However, this income increase did not decrease food expenditure shares and in fact the coefficient is positive although not statistically significant.[vii]

Table 5: Impact of RPS and Initial Consumption Level on Food Consumption, Diversity, and Expenditure Share

	Change 2002 to 2000 Per Capita Food Consumption	Change 2002 to 2000 # of Unique Food Items	Change 2002 to 2000 % of Budget on Food
RPS	1041.169	3.503	4.347
	(565.21)#	(1.618)*	(4.39)
Poor 2000	2770.71	3.181	-0.395
	(332.617)**	(1.128)**	(2.24)
Moderately Poor 2000	1848.526	0.908	-2.575
	(358.408)**	(1.20)	(3.58)
RPS*Poor 2000	-429.675	0.498	0.225
	(506.03)	(1.70)	(4.37)
RPS*Moderately Poor 2000	-414.257	2.591	-2.08
	(551.57)	(1.79)	(5.37)
Household Size	-24.315	-0.099	0.219
	(25.48)	(0.13)	(0.41)
Household Head Female	93.347	1.08	-0.905
	(195.89)	(0.85)	(1.89)
Constant	-2520.079	-0.366	-4.003
	(445.500)**	(1.40)	(3.55)
Observations	1045	1045	1045
R-squared	0.28	0.15	0.02

N = 1045 Robust standard errors in parentheses
# significant at 10% level, * significant at 5% level; ** significant at 1% level

Table 5 showed that both per capita food expenditures and variety declined in the two year period for non-poor households. As will be shown in the next section, this decline is likely the result of a shock to coffee prices. We now turn to the impact of the coffee price crises on changes in food per capita consumption by comparing coffee and non-coffee communities , where *Coffee Community = 1* if the household is in a coffee farming community. We present

separate estimates by initial consumption levels. Results indicate that being in a coffee community decreased total consumption by $C 475 for moderately poor households, a result significant at the 10% level. Similarly coffee communities saw larger declines in food diversity for both moderately poor and non-poor households with losses of 2.7 and 3.9 food items, respectively. However, the coffee crisis did not seem to impact poor households as much as wealthier ones. This result is surprising, because poor households typically perform wage labor during the coffee harvest. One possible explanation is that wealthier households were mostly land owners whose returns to the land were greatly affected by the decline in coffee prices.

As in the previous Table, the variable RPS measures the program's impact for the omitted group, in this case non-coffee communities. In this case, the evidence of effects on food expenditures and diversity are weaker, and in the case of the moderately poor and non-poor no longer statistically significant. Next, to estimate how the impact of RPS is altered by the shock to coffee prices , since for Coffee communities RPS impacts are measure by (*RPS + RPS*Coffee*) The interaction measure was insignificant for all three groups, suggesting that the coffee crisis did not change RPS impact on food consumption or diversity.

Table 6: Impacts of RPS and Coffee Communities on Changes in Food Per Capita Consumption and Diversity

Dependent variables	**Change in Per Capita Food Consumption**			**Change in Food Diversity**		
	Poor	**Moderately Poor**	**Non-Poor**	**Poor**	**Moderately Poor**	**Non-Poor**
Variables						
RPS	731.07	575.63	1,057.80	3.84	3.47	2.41
	(386.65)#	(391.83)	(806.61)	(1.774)*	(1.91)#	(2.16)
Coffee community	-84.36	-474.65	-1,581.25	-0.47	-2.72	-3.89
	(228.97)	(261.69)#	(790.38)**	(1.13)	(1.103)*	(2.11)#
RPS* Coffee community	-234.67	158.09	-693.37	0.24	4.53	0.08
	(403.79)	(488.23)	(998.60)	(2.13)	(2.93)	(2.83)
Per Capita total consumption 2000$	-0.22	-0.41	-0.56	0.27	0.16	-0.98
	(0.11)	(0.149)**	(0.087)**	(0.62)	(0.84)	(0.021)**
Household size	-39.01	-71.40	-25.43	-0.11	0.08	-1.06
	(20.32)	(48.42)	(99.99)	(0.11)	(0.32)	(0.347)**
Female head	-27.26	470.84	300.26	0.36	2.62	0.70
	(153.86)	(378.02)	(823.08)	(0.97)	(1.71)	(1.91)
Constant	802.27	1,328.21	2,779.97	2.75	1.41	14.35
	(319.454)*	(626.680)*	(1,301.378)*	(1.65)	(4.17)	(3.770)**
Observations	557	325	163	557	325	163
R-squared	0.11	0.12	0.35	0.12	0.2	0.22

Robust standard errors in parentheses
$ Per capital total consumption is in 1000s for the diversity measure

significant at 10% level* significant at 5%; ** significant at 1%

Like the previous model, the next analysis compares impacts for non-coffee communities (*RPS*) and coffee communities (*RPS + RPS*Coffee*). This next set of results -which examine 7 food groups-,indicate that RPS was particularly effective at increasing per capita expenditures on fruit and vegetables (see Table 7 below). This is indeed an important result. As noted in the literature section, it is not just how much food a household consumes, but also what type. RPS increased per capita consumption on both fruits and vegetables by $C 50 and 78, respectively, for non-coffee communities.

Table 7 also indicates how households reacted to the coffee crisis. Coffee communities (*Coffee* = 1) saw significant declines in per capita consumption of cereals and fruits between 2000 and 2002 with declines of $C249 and $C 53 respectively. These declines represent substantial effects on household food expenditure considering average per capita food consumption was $C 2300 in the baseline.

Finally, we examine the effect of the coffee crisis on RPS impacts as measured by the interaction term (RPS*Coffee) show. Of the 7 food groups, only fats increased more in coffee communities than non-coffee from the program, which may indicate that households substituted fat for more expensive animal products that include meat. This result coupled with the increase (although not statistically significant) in fat consumption during the shock in both control and treatment communities support this conclusion.

Table 7: Impacts of Coffee and RPS on Food Expenditures by Food Category

Dependent variables	**Change in household food expenditures by food category**						
	cereals	**lentils**	**Dairy**	**Animal Products**	**Fats**	**fruits**	**Vegetables**
RPS	146.614	46.903	106.714	105.573	12.152	50.887	77.548
	(146.71)	(38.91)	(66.02)	(71.30)	(9.87)	(22.604)*	(27.322)**
Coffee community	-249.185	-12.259	-84.916	-53.893	7.351	-53.101	-17.375
	(108.400)*	(37.38)	(54.31)	(56.75)	(9.47)	(20.334)**	(26.41)
RPS*coffee	-127.771	-16.799	29.088	-33.878	47.624	-3.947	-2.384
	(187.91)	(48.49)	(83.07)	(88.72)	(16.687)**	(38.48)	(39.48)
Pc total consumption 2000	-0.199	-0.03	-0.04	-0.068	-0.012	0	-0.02
	(0.033)**	(0.004)**	(0.014)**	(0.014)**	(0.002)**	(0.01)	(0.004)**
Household size	-3.849	2.367	-2.97	-14.994	-1.439	-1.04	-4.828
	(9.63)	(3.53)	(4.73)	(6.591)*	(1.61)	(2.25)	(2.277)*
Female head	104.36	25.221	35.989	51.341	2.429	-0.846	17.896
	(64.50)	(29.82)	(28.66)	(31.26)	(7.81)	(15.48)	(16.09)
Constant	-103.614	-15.43	-28.856	-7.491	-9.371	-8.037	-10.57
	(89.28)	(63.89)	(38.03)	(42.94)	(10.25)	(30.43)	(27.28)
RPS +RPS*Coffee			+++		+++		+++
R-squared	0.29	0.08	0.04	0.07	0.14	0.13	0.08

N = 1045

The final analysis examines household food diversity as measured by the number of unique food items consumed with a similar structure to the previous analysis on expenditures by food groups.

Again the results support the efficacy of RPS in non-coffee communities as it increased the diversity of dairy, animal products, and fruits by about ½ an item each, and vegetable by 1 item. These results are consistent with the previous analysis on total food diversity.

There was a minimal impact of the coffee crisis on food diversity as on average households in coffee farming communities saw a decline of .6 in the number of unique food items in the cereal category, while none of the other 6 categories was statistically significant.

The interactive effects of coffee price shocks and RPS (RPS*Coffee) are small as there are no significant interaction terms. However, An F-test of RPS + RPS*Coffee is significant for cereals, but there is no strong evidence of an additional impact of RPS during the coffee price shock.

Table 8: Impacts of Coffee and RPS on Food Diversity by Food Category

	Change in household food diversity by food category						
	Cereals	**Lentils**	**Dairy**	**Anim. Pr**	**Fats**	**fruits**	**Vegetables**
RPS	0.345	0.032	0.442	0.595	-0.039	0.608	0.96
	(0.25)	(0.07)	(0.203)*	(0.305)*	(0.06)	(0.221)**	(0.464)*
Coffee community	-0.646	-0.019	-0.076	-0.305	0.025	-0.023	-0.339
	(0.190)**	(0.07)	(0.13)	(0.25)	(0.09)	(0.20)	(0.35)
RPS*coffee	0.418	0.037	0.347	0.129	0.151	-0.224	0.757
	(0.33)	(0.09)	(0.26)	(0.41)	(0.10)	(0.44)	(0.62)
Pc total consumption	-104.48	-26.779	-33.397	-102.43	-43.208	15.266	-134.26
	(21.811)**	(8.180)**	(18.349)*	(29.015)**	(9.886)**	-31.294	(55.214)**
Household size	0.012	0	-0.016	0.002	-0.017	0.024	-0.081
	(0.02)	(0.01)	(0.02)	(0.03)	(0.01)	(0.03)	(0.039)*
Female head	0.105	-0.023	0.077	0.187	-0.007	0.327	0.087
	(0.20)	(0.05)	(0.14)	(0.20)	(0.08)	(0.165)*	(0.24)
Constant	0.794	0.182	0.273	1.044	0.33	-0.147	1.527
	(0.220)**	(0.084)*	(0.20)	(0.348)**	(0.131)**	(0.26)	(0.499)**
RPS +RPS*Coffee	+++		+++	+++		+++	+++
R-squared	10%	3	10%	3%	8%	4%	11%

Robust standard errors in parentheses
N = 1045

Section 6: Conclusion

The econometric analysis in the previous section yields several key results. First, it supports the efficacy of the RPS program at increasing both food consumption and diversity. The program success is further supported by an analysis that shows RPS was generally more successful at increasing consumption in key food groups like fruit and vegetables. The next analysis examined the impacts of an exogenous shock to coffee prices showing that the shock decreased per capita expenditures and diversity. Furthermore, the shock was particularly harmful to those who were wealthier in the baseline. Finally, we interacted RPS effects with the shock and did not find that RPS impacts were changed during the price crisis, with the exception of coffee communities in the treatment group substituting fat for meat.

Over the last decade, conditional cash transfer programs like RPS have become one of the main policy tools to address the lack of human capital development in the poorest areas in Latin America. These programs use a multipronged approach to increase human capital accumulation through improvements in health, nutrition and education. Previous studies of RPS and other conditional cash transfer programs have shown that much of the money given through these programs has been spent on food although spending on food is not required, but encouraged. This could suggest that non-cash elements of the program such as nutrition seminars or targeting transfers to women could change household preferences, although it is also possible that the increases simply stem from the households' increased income.

Our results show that, for the most part, RPS impacts on increases in food consumption expenditures and variety were not influenced by either baseline expenditure level or an exogenous shock to coffee prices. This result counters the prevailing theory that income

elasticity of food consumption declines with increasing income, which is the underlying assumption of the Engel curve. If this Engel's theory was applicable in this case, a smaller percentage of the transfer would be spent on food when household income increased from the RPS transfer. However, both a negative shock and initial poverty status did not impact the effect of the impact transfer.

Our results suggest that regardless of total expenditures (a proxy for poverty), the marginal impact on food consumption of a cash transfer is relatively constant, regardless of baseline poverty or exogenous shocks. On the other side, undertaking the various targeting activities required to reach the very poor may represent a significant share of total program costs (Caldés and Maluccio, 2006).Consequently, from a food security point of view, decreasing the program costs associated to such targeting activities may be justified in terms of program efficiency if such freed resources are used to increase or improve non-cash elements of the program (such as health and nutrition workshops targeted to women).

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[i] The name of the Mexican conditional cash transfer program is now called Oportunidades, however it was called Progresa during the time period studies in the cited works. We refer to this program as Progresa throughout the paper.

[ii] Schooling was also a major component of the transfer as payments were tied to school attendance for children 7-13. This conditionality in the RPS program led to increases in school enrollment by 13-20 percentage points (Maluccio and Flores, 2004).

[iii] (See Flores and Maluccio (2004) for a more detailed description of the program design).

[iv] (C$ is September 2000, Nicaraguan córdobas, $1 U.S. is about C$ 12.85).

[v] Studies from developing countries have shown positive association between dietary diversity and nutrient adequacy (that is a diet which meets requirements for energy and all essential nutrients) (Hatloy 1998; Ogle et al 2001; Ruel 2003).

[vi] It is worth noting that our sample only includes eligible households, around 1% of the households were ineligible for the program for having assets (either land or a vehicle) that indicated they did not need the program.

[vii] The rest of the analysis omits expenditure share. Both analysis for the price shock and by poverty group do not yield statistically significant results. These results are available upon request.