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An Impact Evaluation of Agricultural Subsidies on Human Capital Development and Poverty Reduction: Evidence from Rural Mexico

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ABSTRACT

The Mexican Government initiated two innovative programs cash transfer schemes in the last decade: PROGRESA, which is a national anti-poverty scheme directed at chronic rural poverty, and PROCAMPO, a scheme designed to compensate farmers for the negative price effects of NAFTA. The analysis of data collected for an evaluation of PROGRESA suggests that the overall level of food consumption and health check-ups is lower among PROGRESA households that also participate in PROCAMPO. This may be due to lower outcome levels at baseline, but also because PROCAMPO households are agricultural producers and thus face a higher shadow price of time in the face of credit or labor market imperfections. In addition, PROGRESA households attain higher levels of human capital investment after only one year of program participation compared to PROCAMPO households who have been in that program for four years. And while PROCAMPO households have higher levels of investment spending, this does not lead to significantly higher levels of consumption relative to PROGRESA households. The overall conclusions are that program conditionality does influence longer-term (human capital) and medium term (productive) investment decisions, the receipt of multiple forms of treatment by beneficiaries can affect the overall impact of each individual program, and conditional transfers may have muted effects among agricultural households in the face of market imperfections.

JEL codes: D1, H53, I38

Key words: Cash transfers, Agricultural households, Mexico, poverty

INTRODUCTION

In recent years, conditional cash transfer schemes for poverty alleviation have become increasingly popular in Latin America as an alternative to traditional broad-based policies such as subsidies or in-kind transfers. This new generation of programs began with the introduction of PROGRESA1 in Mexico, and typically conditions the receipt of transfers on specific human capital enhancing behaviors such as school attendance and health check-ups and includes an educational component for parents on basic health and nutrition. Based on the successful Mexican experience, conditional cash transfer anti-poverty programs have sprung up through out the region, and are currently either under design or implementation in Brazil (Bolsa Familia), Colombia (Familias en Acción), Costa Rica (Superémonos), Honduras (Programa de Asignación Familiar), Jamaica (Poverty Alleviation through Health and Education), and Nicaragua (Red de Protección Social). Given the rate at which other countries are adopting the PROGRESA model, PROGRESA is currently the most influential poverty alleviation initiative in the region

Cash transfers have always been part of the rural poverty alleviation strategy in OECD countries, often as compensation for the ending of government subsidies and/or trade liberalization. These cash transfers are also typically linked to conditions, but on the production side, with payments tied or 'coupled' to specific cultivation of land or crops. However cash transfer schemes for agricultural development are rare in developing countries, with the notable exception of Mexico, where the PROCAMPO2 program was introduced in 1994 to compensate farmers in staple crops for losses expected under NAFTA. PROCAMPO is the first and only agricultural support program in the region that provides direct cash benefits to farmers.

The economic benefits of linking program eligibility to conditionality such as production or investments in human capital are unclear and a matter of policy importance since conditions are costly to monitor. Given the history of conditional cash transfer programs in the OECD, there is an existing debate about whether conditions linked to production (i.e. decoupling payments from production) are necessary or even optimal. For example, in the case of agricultural programs the concern is that conditions placed on transfer payments to farmers induce them to stay in agriculture and continue to invest in agricultural production instead of more profitable non-agricultural activities (Beard & Swinbank, 2001; Guyomard, 2000; Harvey, 1998). Conditionality in the new generation of anti-poverty programs has not yet been studied because these programs are relatively new and enough time has not yet passed to assess the potential long-term impact on human capital development that they intend to foster. Nevertheless, even in this setting, the issue of conditionality is controversial, since in poor countries with less developed infrastructure and institutions, the administrative cost of monitoring compliance can be very large. In the extreme case that the cash transfer alone is sufficient to induce behavioral change through income effects, costs savings from monitoring compliance can translate into increased coverage or higher benefit levels for the poor.

[1] This is the Spanish acronym for the Program for Education, Health and Food (*Programa de Educación, Salud y Alimentación*). In 2002 PROGRESA changed its name to Oportunidades.
[2] This is the Spanish acronym for Program of Direct Payments to the Countryside.

The design and implementation of PROGRESA and PROCAMPO has placed Mexico at the forefront of rural development interventions in the region. The use of cash and the innovative adoption of program conditionality in two distinct programs, one focusing on short term poverty alleviation and human capital development, the other focusing on production and investment, provides an interesting case study of the impact of these alternative strategies on rural development and poverty alleviation. The objective of this article, therefore, is to examine how the design of cash transfer schemes influences household behavior and welfare outcomes with particular reference to outcomes that are tied to program conditionality such as school enrolment, health care utilization, food consumption and investment. We use a special panel data set which was collected as part of the social experiment to measure the impact of PROGRESA on poor rural households, and which also contains information on receipt of PROCAMPO. We use econometric analysis to explore several hypotheses related to the impact of these two programs. First, since these two programs have different and potentially conflicting objectives (production versus consumption and human capital accumulation), we assess whether participation in both programs diminishes the impact of each program, enhances the effect of one over the other, or enhances the effect of both. And since PROCAMPO beneficiaries are agricultural households, they face additional constraints that may further inhibit the impact of PROGRESA on their behavior. Second, we analyze whether in the medium term, a production based intervention like PROCAMPO can raise human capital investment and thus achieve the objective of a PROGRESA type program. Similarly, we investigate whether PROGRESA is able to stimulate productive activity despite its focus on consumption and human capital development.

The paper contributes to the literature in several ways. It is the first study that directly compares the impact of a human capital development program with an agricultural subsidy, an issue which is relevant to both rich and poor countries alike. It is also the first study to apply the theory of the agricultural household to a conditional cash transfer program. While it is well known that the response to public policy by agricultural households can be muted (de Janvry, Fafchamps & Sadoulet, 1991), the implication of this theory to the new generation of poverty alleviation programs has not previously been considered, and has important implications for their design and effectiveness.

I. CASH TRANSFERS IN RURAL MEXICO

A. PROCAMPO

PROCAMPO initiated transfers in the winter 1994 agricultural season and was designed as a 15 year transition to free trade. Eligibility, and therefore the maximum level of PROCAMPO transfer payments, vary across households and are based on household behavior during the pre-PROCAMPO period. PROCAMPO provides eligible agricultural producers with a fixed payment per hectare which is the same across the whole country. The level of eligibility is dependent on the total hectares of nine key crops (corn, beans, rice, wheat, sorghum, barley, soybeans, cotton and safflower) that were planted in any of the three corresponding (autumn-winter or spring-summer) growing seasons prior to and including August 1993. Eligibility was tied to particular parcels and those with usufruct over these land parcels, not specific farmers, and payment should go to whomever is planting the property, whether owner, renter or sharecropper. The eligibility roster was fixed prior to commencement of the program; no new properties have been added since 1994.

Theoretically, the farmer receiving payment for a particular property may change, depending on who is using the land, though in practice most benefits accrue to the owner, either directly or through the rental price. Since there are potentially two agricultural seasons per year, PROCAMPO payments may be made up to twice a year, though in general only farmers with access to irrigation can take advantage of the second agricultural season. Payments correspond to the amount of land currently under production or that is part of an official environmental management program, an amount that cannot exceed the amount of land registered in the eligibility roster. Fallow land does not merit payment, making it unlikely that households have received payment every year since 1994 for a specific parcel of land. The conditionality of the cash transfer is that farmers must prove that the parcel is being used in a manner deemed appropriate by the program. Monitoring of actual land use is haphazard, and devices are occasionally employed to skirt this requirement. However, given the program is based on past agricultural production and the requirement that farmers continue to produce or participate in an official environmental management program the intervention is closely and intentionally linked to agricultural production.

PROCAMPO covers 95 percent of the cultivated area in Mexico that had been planted in corn, beans, sorghum and wheat (SAGAR, 1998); this represents approximately 14 million hectares and almost three million producers a year. Annual payments are over US$1 billion which is 60 percent of the budget of the Ministry of Agriculture (Fox 2003). PROCAMPO is particularly important in the ejido (land reform) sector where 84 percent of ejidatarios participated in PROCAMPO and received payments for, on average, 5.2 hectares (Cord and Wodon, 1999). Since PROCAMPO is distributed on a per hectare basis, larger farms have tended to get higher total transfers. Households with less than 5 hectares make up 45 percent of recipients but receive only 10 percent of total transfer payments (SAGAR, 1998). However, PROCAMPO provides a uniform payment per hectare regardless of yield or if the output was sold on the market. PROCAMPO thus over compensates smallholders who may have had limited yields and reaches households who did not benefit from pre-NAFTA price supports because they had no marketed

surplus (Martinez, 1999). In 1997, payments averaged US$329 per recipient and US$68 per hectare (Sadoulet, et al, 2001).

B. PROGRESA

PROGRESA was initiated in Mexico in 1997 as a mechanism for addressing extreme poverty in rural areas. The primary thrust of PROGRESA is to develop the human capital of poor households by improving education, health and nutrition outcomes. The condition for receipt of transfers by participant households is to visit health care clinics, send children to school and for an adult to attend a monthly health seminar. Transfers, with rare exception, are provided directly to mothers under the assumption they are more likely to use funds in a manner that will be beneficial to the development of their children.

PROGRESA is poverty targeted, and selection of eligible households was done in three stages (see Skoufias, et al, 2001). First, potential recipient communities were identified as poor based on an index of marginality developed from the national population census using community data including the share of illiterate adults, access to water, drainage and electricity, number of occupants per room, dwellings with a dirt floor and population working in the primary sector. Second, households were selected for participation in PROGRESA based on data collected from a household census within the community. Scores were produced for each household using discriminant analysis and households above a certain line were included as beneficiaries. Third, the list of selected households was presented to community assemblies for review and discussion, though in practice these lists were rarely modified. Not all households in targeted communities are eligible to receive the program.

By the end of 1999, PROGRESA provided bimonthly transfers to approximately 2.3 million households or about 40 percent of all rural families and 11 percent of all Mexican families. The program operated in almost 50,000 communities, and had a budget of US$777 million or nearly 20 percent of the Mexican government's budget allocation for poverty alleviation (Skoufias and McClafferty, 2001). In 2001 the Fox administration changed the name of the program to OPORTUNIDADES and expanded coverage to semi-urban and poor urban areas. The program budget reached US$1.9 billion in 2002, covering nearly 3 million rural households and over 1.2 million urban ones (Fox, 2003). Because PROGRESA conditions payment of transfers on school attendance and visits to health care facilities, it was expected and has been shown that the program had a significant impact on education attendance and health outcomes (Skoufias and McClafferty, 2001).

Households receiving PROGRESA are not permitted to receive other forms of anti-poverty or education subsidies, but this does not apply to PROCAMPO benefits since it is not an anti-poverty program. Thus PROGRESA and PROCAMPO transfers are provided to eligible rural households at the same time. A large number of households are eligible to receive transfers from both sources.

II. THEORETICAL CONSIDERATIONS

A. Differences in program design and objectives

There are several key differences in the objectives, eligibility and implementation of the two programs that can yield different behavioral responses. Both programs impose conditions so that transfers exert income and substitution effects; whether the two programs lead to similar outcomes depends on the relative strength of these two effects. If income effects dominate in both cases, we expect little difference; alternatively, if there are strong substitution effects in either case, outcomes may vary indicating conditionality matters. Furthermore, the influence of either effect may depend on the time that has lapsed since the program began operation. If a cash transfer program leads to an increase in investment, it may induce a multiplier effect that significantly raises household income. In this case, the demand for normal goods such as food, education and health will increase and may reach the level of demand induced by specific conditions. Thus a program like PROCAMPO that is linked to agricultural production and agricultural spending may, over time, mirror the outcomes of a program like PROGRESA that requires school enrolment. In our data, PROCAMPO households have been in the program for 4 years, sufficient time for multiplier effects to have taken hold if indeed they are important.

Differences in program objectives translate into differences in program eligibility which may complicate the comparison of the two programs. PROGRESA is poverty targeted so the typical beneficiary is poor; PROCAMPO is targeted to staple crop farmers, a significant group of which are not poor. The data we use is from a survey of very poor households who are eligible for PROGRESA, and is not representative of the typical PROCAMPO beneficiary, hence the interpretation of our results for PROCAMPO must be restricted to this specific group and not all program beneficiaries. It may well be the case, for example, that larger or wealthier farmers are in a better position to take advantage of PROCAMPO participation relative to the farmers in our sample.3 Nevertheless, many PROCAMPO farmers are poor, and the issue of whether this program has had an impact on the poorest and most vulnerable is clearly of policy interest.

Finally, PROGRESA explicitly delivers its transfers to mothers (or female adults of the family) under the assumption that the money is more likely to be spent on food or in other socially beneficial ways. PROCAMPO, on the other hand, is geared towards farmers which results in males being the primary recipients of the cash transfers. In our data for example, 99 percent of PROGRESA beneficiaries are women, while 92 percent of PROCAMPO beneficiaries are men. This implies that observed differences in program impacts may not simply represent program conditions and structure, but also gender differences in household behavior. Indeed in the case of PROGRESA, gender differences in household resource allocation is explicitly assumed and taken into account in program design.

B. Differences between agricultural and non-agricultural households

The response of PROCAMPO beneficiaries to the PROGRESA program may also be different because Procampo households are agricultural ones, and are thus both producers and consumers

[3] Using a different data set, Sadoulet et.al (2001) show that this is indeed the case.

of basic foods, and more importantly, demanders and suppliers of wage labor. The basic economic model of an agricultural household (AH) illustrates that the responsiveness to price changes of commodities they produce and consume depends crucially on whether they are net buyers or sellers of the commodity (see Taylor & Adelman (2003) and Singh, Squire & Strauss (1986) for a review of the theory). In the case of an increase in an output price, for example, the AH suffers a loss in real income as do other households do, but as a producer the AH benefits through increased profits; it is because of this 'profit' effect that the net response (demand) of an AH to a change in output price is actually ambiguous.

The production and consumption decisions of AHs can be separated into two distinct problems if perfect markets exist (the separability condition). Under such conditions, the household can first make all production decisions which lead to an implied level of profit. This profit, plus any unearned or transfer income can be taken as the budget constraint for the household in the utility maximization decision over consumption. The link between the two problems is the wage rate, which enters both the production side and the consumption side (as the price of leisure) and the output price of own farm production, which effects both profits and the consumption budget constraint. The separability result breaks down when some markets are not perfect, as is very likely the case among poor AHs in rural Mexico. In this scenario, production decisions will depend on endogenously determined shadow prices for non-traded items, and these shadow prices will depend on household preferences. Two key market failures are very likely to be present among the households that are PROGRESA beneficiaries: first, AHs will likely face cash or liquidity constraints because of imperfect credit markets, and second, there may be friction in the labor market leading to binding constraints in the amount of off-farm labor available to the households, either to buy or to sell.

Consider first the cash constraint. This constraint will be more binding for poorer AHs and those with larger on-farm activity (everything else equal); the constraint will not exist for non-AHs. For the AH, the price of an activity that enters into the constraint will be marked up by the shadow price of credit; the more binding the credit constraint the higher the shadow price and the greater the mark-up. Activities that relax the constraint (that generate cash) such as off-farm labor supply or cash crop production will be preferred (their 'internal' price is higher than market price to the household), while activities that make the constraint more severe (purchased intermediate inputs like fertilizer or farm equipment) will be reduced since the 'internal' price of these activities to the household is higher than market.

Now consider a binding labor market constraint such as a fixed availability of off-farm labor (H) opportunities. Desired labor supply of an AH (Ls) is composed of on-farm labor demand (Ld) and off-farm labor demand (Lo) such that $Ls > Ld + Lo = Ld + H$ in the face of limited off-farm labor opportunities. The shadow value of time within the household will now change to bring supply and demand into balance; this entails a reduction in the household's shadow wage which dampens labor supply and increases leisure time. For the non-AH there is no available on-farm labor demand (Ld); for these households $Ls > H$. This constraint will always be more binding (holding family size constant) because of the absence of the potential for absorbing desired labor supply on the farm; the endogenous shadow wage for these households must thus decline by a greater amount (relative to an AH) in order to bring the equation into balance (see Benjamin (1992) for a thorough discussion of this point).

We illustrate the implication of a credit constraint for an AH more formally with a simple model of a household producing one output (q_m) which can be traded or consumed (c_m), and which uses a market purchased input (x), hired labor (L_h) and a fixed input (A).4 The household has a time endowment (T) which is distributed among leisure (c_l) and labor supply to the farm (L_f) or off the farm (L_o). The household chooses c_m, q_m, c_l, L_f, L_o, L_h, and x in order to maximize utility as follows:

Maximize $U(c_m, c_l)$ subject to

(1) $F(X, L_h, L_f; A) = q_m$ production technology

(2) $p_x*x + p_p*c_l + p_m*c_m + p_l*L_h + p_l*L_f = p_m*q_m + p_l*T$ cash constraint

(3) $p_x*x + p_l*L_h \leq C + p_m*q_m + p_l*T$ credit constraint

In this scenario the purchased farm inputs x and L_h are subject to a credit constraint (C) and p_i is the price of i. The Lagrangean for this problem is:

(4) $L = U(c_m, c_l) + \lambda [p_c*q_c + p_l*T - (p_x*x + p_l*c_l + p_m*c_m + p_l*L_h + p_l*L_f)] + \eta[C + p_m*q_m + p_l*T - p_x*x - p_l*L_h] + \theta [F(x, L_h, L_f; A) - q_m]$

The relevant first order conditions on the production side are those with respect to q_m , x L_f and L_h respectively:

(5) $\lambda p_m + \eta (p_m) - \theta = 0;$

(6) $\lambda (-p_x) + \eta (-p_x) + \theta F_x = 0;$

(7) $\lambda (-p_l) + \eta (-p_l) + \theta F_h = 0;$

(8) $\lambda (-p_l) + \theta*F_f = 0;$

Substituting (5) into (6), (7) and (8) and minor manipulation yields the following three relationships:

(9) $p_m [1 + (\eta/\lambda)] F_x = p_x [1 + (\eta/\lambda)]$

(10) $p_m [1 + (\eta/\lambda)] F_l = p_l [1 + (\eta/\lambda)]$

(11) $p_m [1 + (\eta/\lambda)] F_f = p_l$

Equations (9), (10) and (11) illustrate the importance of the credit constraint in the production decision of the AH. In general, the household will hire labor L_h and intermediate inputs (x) until

[4] This model is a version of the model outlined in Chapter 6 of Sadoulet & de Janvry (1995).

the value of the marginal product (marked up by the value of the additional cash to the household) is equal to the market price (p_i) of the factor, which is similarly marked up to reflect the relative scarcity of cash. On the other hand, family labor L_f is not marked up by this additional cost, while the value of its marginal product is marked up; the credit constraint thus makes L_f cheaper relative to L_h inducing a substitution away from the latter and towards the former.

Keeping in mind the different constraints and options available to AH and non-AH households with market imperfections we can now describe the potential for differing responses to Progresa among these two types of households, beginning first with the nutrition (cash) transfer component of Progresa. The quid pro quo to receive this component of the benefit is to attend a schedule of preventive health check-ups which is applicable for all household members but that is particularly rigorous for pre-school children. The implication of the latter is a time cost for the adult members of the household who must accompany young children to the health clinic. For a cash constrained AH, the time cost of fulfilling the requirement, assuming it conflicts with either farm or off-farm labor supply, is higher (by the shadow price of the constraint) relative to non-AHs.5 These households will thus be less likely to take up this component; if they do take up the benefit, they will fulfill the requirement at the minimum or be more likely to be in breach of the requirement (which if done consistently, will lead to eventual expulsion from this component of the program). The prediction from the analysis is therefore that Progresa can have a lower impact on Procampo households (who are AHs) relative to non-Procampo households in the program. This prediction also holds true for the case of labor market constraints as outlined above. Progresa only households (non-AHs) will have a lower endogenously determined shadow wage, leading to a lower time cost of fulfilling the quid pro quo for the nutrition transfer.

The *quid pro quo* for the school subsidy is to enroll a child in the relevant age range and maintain a minimum attendance. Assuming that the direct benefit of schooling is not large, the household must compare the value of the subsidy to the opportunity cost of the child's time. In the case of a cash constraint, the foregone product in a Procampo household (if the child were to attend school) is marked up by the shadow price of credit and will thus be higher than a non Procampo household. On the other hand, the value of the Progresa subsidy will be higher in an AH (due to the shadow price of cash) so that the final response is ambiguous, and depends on the price of the marketed output whose product is foregone. If the output price is low or if output markets are weak then the Procampo household will be induced to accept the school subsidy; households that produce a marketed surplus with a buoyant demand will be less likely to take up the Progresa subsidy, or if they do, will be more likely to violate the rules or to comply at the minimum.

The prediction in the case of the labor market constraint is the same for the school subsidy as it is for the nutritional transfer; the AH has a higher endogenous shadow price of time because of the opportunity for on-farm activities to absorb desired labor supply, leading to a greater likelihood that the school subsidy will not be high enough to compensate the household. Procampo households who qualify for Progresa will thus be less likely to take up the school portion of the program, and if they do, will be less likely to comply completely.

[5] Specifically, the value of the product foregone by not working on the farm is marked up by the shadow price of credit. Hired labor to replace family labor is also marked up by this internal price.

III. DATA AND EMPIRICAL APPROACH

A. Data

We use data from a social experiment that was launched at the end of 1997 to evaluate the impact of PROGRESA. During the second phase of expansion of the program, 506 localities were selected to participate in the experiment; one-third of these localities were randomly selected for delayed entry and served as the control group, while the remaining localities began receiving benefits in mid 1998. A baseline survey was administered in March 1998 and 4 follow-up rounds of data were collected approximately every 6 months (the surveys are called Encuestas de Evaluación, or ENCEL); in this article we use the baseline and May/June 1999 rounds of data.

The ENCEL surveys collected data on all households in the 506 treatment and control communities numbering over 24,000 households in total. We focus our attention on families originally classified as poor (i.e. eligible for PROGRESA).6 The ENCEL data set also collected information on whether the household received PROCAMPO benefits, and if so, the value of these benefits. Note that by March 1998 PROCAMPO households in the ENCEL survey would have been in that program for over four years; as discussed earlier, we therefore expect that any potential multiplier effects would have been realized by this time.

B. Outcomes

We analyze the behavioral effect of the two programs on 9 different outcomes encompassing household expenditures and children's schooling and health care utilization. For expenditures we look at both total and food consumption as these are where we would expect to see the largest impacts of PROGRESA, but we also analyze other dimensions of expenditure behavior such as schooling, health and hygiene, and adult and children's clothing. The human capital outcomes are whether a child age 0-5 attended a preventive health check-up in the last 6 months, and whether a child age 12-15 was enrolled in school—both of these activities are part of the PROGRESA conditionality. We also report school enrolment results separately for boys and girls to look for sex differences in impact, and experiment with the 13-15 age group since drop-out rates increase with age.

While PROGRESA emphasizes food consumption, PROCAMPO conditions transfers on land use and is thus focused on productive activities, so we also use agriculture and business spending as an outcome variable. Unfortunately this information is not reported at baseline, but is collected in October 1998 and May/June 1999. The fact that the earliest round of information is 6 months after program implementation is not a major concern because many beneficiary households in the evaluation survey actually received only one or no payments by October 1998 due to operational delays in payment transfers and beneficiary enrolment. What is a concern is

6 Initially, PROGRESA classified as eligible about 52 percent of households. Afterward, due to perceived bias against certain kinds of poor households (especially elderly with no children), criteria of eligibility were revised and the program was extended to cover 78 percent of households. Since these households were declared eligible at a later date, most of them started receiving cash transfers some time after the initial households so that the impact of PROGRESA on their consumption could be different. We exclude these households from our sample.

that the two survey rounds correspond to different parts of the year and are thus subject to (different) seasonal effects related to the agricultural production cycle. Agricultural spending includes inputs such as seeds, fertilizer, equipment and paid labor but not land rent; business spending includes money spent to realize own account paid work such as sewing, preparation of food for sale, construction, buying and selling goods, or transportation of goods or people. Because many households do not spend any money in these activities, we construct a dummy variable indicating whether or not the household incurred any such spending and use this as an additional outcome variable. We hypothesize that PROCAMPO households are more likely to incur agriculture or business spending, and would like to see whether PROGRESA households are also induced to invest in own account paid activities to earn additional income.

C. Empirical specification

We begin our econometric analysis by estimating, for each year separately, a reduced form equation that relates each outcome to a set of household level control variables and dummy indicators for program participation:

$$(12) \quad C_i = b_0 + b_1*PROGRESA_i + b_2*PROCAMPO_i + b_3*BOTH_i + b_4*X_i + u_i$$

where C is the outcome of interest, PROGRESA, PROCAMPO and Both are dummy variables indicating the program in which the household participates, X is a vector of control variables and u is a normally distributed random error term. For the expenditure variables equation (12) can be interpreted as an Engel curve; for the human capital outcomes equation (12) can be interpreted as a reduced form demand equation for health or schooling derived from a household utility maximization problem which includes a household production function for health or schooling.

The control variables that enter the X vector include 12 demographic variables, 5 variables indicating possession of different types of farm animals or livestock (household assets), 3 variables indicating access to land (land holdings, irrigated land and cultivated land), household per capita income, and community level prices for approximately one dozen basic food items. In addition, the human capital outcome equations include child specific variables (age and sex) and in the case of health care utilization, parental education and distance to a health clinic. Summary statistics for all the control variables for 1998 are presented in the appendix.

Program participation is captured through dummy variables which, in the framework of equation (12), measure the mean difference in outcomes by household type (conditional on X) pre- and post treatment. In our data we observe households reporting PROCAMPO transfers in some rounds and not others, likely due to the timing of agricultural production. Since we are interested in the medium term impact of PROCAMPO we define program participants as those who report positive PROCAMPO receipts in at least 3 out of 4 survey rounds (March 98, October 98, May/June 1999 and November 1999).

D. Identification of program impacts and differenced equations

The experimental design of the sample allows a clean identification of the impact of the PROGRESA program on beneficiaries. Identification of the program impact of PROCAMPO is

more challenging since there is no randomization of participation in PROCAMPO among these households. Specifically, there may be bias in the estimate of the PROCAMPO impact due to the fact that households chose to participate in 1994 (selection bias) or by the design of the program (program placement) although in general all villages have PROCAMPO beneficiaries so the latter bias would be minimal. In our sample around 25 percent of households that report having grown staples (the crops required for eligibility) do not receive PROCAMPO payments. There are also some households (5 percent) that get PROCAMPO transfers but don't grow staples because the program allows different crops to be planted, indicating that in general there is not a direct one-to-one relationship between growing staples and participating in PROCAMPO. If among these 25 percent of households there are households that were eligible in 1994 and purposely decided not to participate then selectivity bias would be introduced into our parameter estimates. Previous work on PROCAMPO (Sadoulet et.al, 2001) and our own knowledge of the program suggest that this group is likely to be very small among these poor households. Nevertheless, if we assume that this selection is determined by unobserved household heterogeneity that does not vary over time, then we can eliminate this bias through a fixed effects estimation strategy, provided we exclude households that do not receive either program from our estimation sample. Consider the following regression at baseline (b):

$$Y_b = \alpha_b + \beta_1 X_{1b} + \beta_2 \Pr ogresa_b + \beta_3 \Pr ocampo_b + \beta_4 (\Pr ogresa_b \cdot \Pr ocampo_b) + \lambda_i + \varepsilon_{ib} \quad (13)$$

where X is a vector of controls, lambda is a time invariant household fixed effect, and ε is a time varying normally distributed error term uncorrelated with the X vector. If we write down the equation for time period 1 (ENCEL May/June 99) and take the difference we get

$$\begin{aligned}(Y_1 - Y_b) = (\alpha_1 - \alpha_b) + \beta_1 (X_{11} - X_{1b}) + \beta_2 (\Pr ogresa_1 - \Pr ogresa_b) + \beta_3 (\Pr ocampo_1 - \Pr ocampo_b) \\ + \beta_4 [(\Pr ogresa_1 \cdot \Pr ocampo_1) - (\Pr ogresa_b \cdot \Pr ocampo_b)] + (\varepsilon_{i1} - \varepsilon_{ib})\end{aligned} \quad (14)$$

If we represent program participation with dummy variables (as in equation 1), the PROGRESA dummy taken on the value 0 at baseline and the PROCAMPO dummy does not vary over time (it is either 0 or 1 at all time periods) but there is variation in the interaction term. Since PROCAMPO participation does not vary over time the fourth term on the right hand side of (3) drops out of this equation, as does lambda, the source of bias. In this case the expected value for households that participate in PROGRESA only is

$$E(\Delta Y \mid \Pr og_1 = 1, \Pr og_b = 0, \Pr oc_1 = 0, \Pr oc_b = 0) = (\alpha_1 - \alpha_b) + \beta_1 (X_{11} - X_{1b}) + \beta_2 \quad (15)$$

while the relevant equations for households that participate in PROCAMPO only and in both programs are respectively

$$E(\Delta Y \mid \Pr og_1 = 0, \Pr og_b = 0, \Pr oc_1 = 1, \Pr oc_b = 1) = (\alpha_1 - \alpha_b) + \beta_1 (X_{11} - X_{1b}) \quad (16)$$

$$E(\Delta Y \mid \Pr og_1 = 1, \Pr og_b = 0, \Pr oc_1 = 1, \Pr oc_b = 1) = (\alpha_1 - \alpha_b) + \beta_1 (X_{11} - X_{1b}) + \beta_2 + \beta_4 \quad (17)$$

It is straight forward to show that the equation for households that do not participate in either program is identical to (16). Consequently, if we run the differenced equation in (14) using dummy variables for program participation and exclude the 'neither' group, then β2 gives the

difference between PROGRESA only and PROCAMPO only and β4 gives the difference between PROGRESA only and 'both'.

Alternatively equation (14) can be estimated using actual monetary values of transfer receipts instead of program participation dummies. This specification gives the marginal effect of an additional peso from each source on the outcome in question, and can be estimated as described in equation (14) over the entire working sample since there is variation in the monetary value of transfers received from each program over time (at baseline PROGRESA receipts are 0). In this specification we use the intent-to-treat value of transfers for each household in each time period. For PROCAMPO households this is simply the per hectare transfer (US$68) multiplied by the amount of land cultivated in each round with two seasons assumed for irrigated land; for PROGRESA households in 1999 this is the theoretical transfer based on household demographic composition and school enrolment. Hence for each of the outcomes described above we estimate a model in first differences (1999 minus 1998), using both dummy variables and actual transfer values, which should be purged of selectivity bias associated with participation in PROCAMPO (if it exists) under the maintained assumption that selection into PROCAMPO is captured by a time invariant fixed effect.

IV. RESULTS

A. Descriptive statistics

Table 1 presents mean values for the outcome variables used in the regression analysis by household program status, while summary statistics for the control variables (demographic composition and asset structure) are shown in Table 2. These are outcomes at baseline, so PROGRESA households are eligible but not actual beneficiaries. This implies that households in columns 3 and 4 are similar in that they have been receiving PROCAMPO for 4 years at this moment in time, while households in columns 2 and 5 have not received either program. The two types of PROCAMPO households (columns 3 and 4) have lower total and food consumption than the other two groups of households, but are almost twice as likely to have incurred investment spending at the time of the survey. Human capital outcomes are also not significantly different among the 4 groups of households although PROCAMPO households who are not PROGRESA eligible (column 3) show slightly higher overall school enrolment and rates of preventive health care check-ups.

The bottom panel of table 1 reports outcomes measured in May 1999 approximately one year after initiation of PROGRESA in the treatment communities and the differences in human capital outcomes are striking. Both sets of PROGRESA households (columns 2 and 4) now have significantly higher school enrolment7 and health check-up rates than PROCAMPO only households, and continue to have higher total and food consumption levels as well. Moreover, households receiving both programs (column 4) appear to have the best human capital outcomes while those in neither program have the worst. The one outcome that is still clearly highest among PROCAMPO households is the propensity to incur investment spending, although overall rates have declined through out the sample, possibly due to seasonality effects.

Table 2 reveals that PROCAMPO and non PROCAMPO households actually have significantly different demographic composition and asset structures. PROCAMPO households have one more member on average, and more members in each demographic category except for adults age 20-34 and young children under age 5; this is consistent with PROGRESA's targeting strategy which emphasizes younger families with small children. PROCAMPO households have significantly more of all assets shown in the table, particularly agricultural land, which is consistent with the objectives of this program to target farming households. Note that despite their stronger asset base, PROCAMPO households have lower income than the other types of households. These differences in household composition and asset structure highlight the very distinct objectives and thus beneficiary selection criteria of the two programs. To the extent that the objectives of the two programs are contradictory, participation in both may weaken the effect of one or the other. The different asset structure and demographic composition may have different effects on household time allocation depending on the degree of on-farm productive activity. Finally, the observed differences in the background variables may reflect further unobserved differences in effort, preferences, and expectations which might also influence the

[7] Overall school enrolment rates have declined due to the age effect; the sample of kids in 1999 are those who were 12-15 at baseline.

success of PROGRESA among PROCAMPO households or vice versa, and which must be controlled for using multivariate analysis.

B. Baseline estimates March 1998

Table 3 reports the coefficients for the dummy variables indicating program status derived from a multivariate regression of the control variables listed in table 2 on each of the outcomes listed in the first column; each row represents a separate regression and pair-wise tests for significance of pairs of dummy variables are given in columns 6-8 (the neither group is the excluded category). The child level regressions also include additional child and parent specific information which are reported in the appendix. The results in column 6 indicate that at baseline, and after controlling for differences in household composition and assets, PROCAMPO only households have higher total and food (at 11 percent significance) consumption, a higher propensity to incur investment spending and lower enrolment rates for boys. The consumption results are opposite to the raw means in the top panel of table 1, and illustrate the importance of controlling for differences in demographic and asset structures.

Column 7 of table 3 reports differences between the two PROGRESA eligible household types (those that currently receive PROCAMPO and those that do not). In this group, food consumption is marginally higher among PROCAMPO households (11 percent significance), spending on adult clothing is lower, and boy's school enrolment is also lower (9 percent significance level). The lower school enrolment among PROCAMPO households may be related to on-farm productive activity as outlined above, and raises the key question of whether PROGRESA will have a different impact among these households compared to PROGRESA eligible households who do not receive PROCAMPO.

Finally, column 8 reports significance levels for a test of equality between the PROCAMPO households who are eligible and not eligible for PROGRESA. The notable difference between these two groups is in investment spending, where PROGRESA eligible households have a significantly lower propensity for investment spending; this group of households also has significantly lower levels of spending on health/ and adult clothing.

C. Cross section estimates May 1999

Table 4 replicates the estimates in table 3 using data from May 1999, approximately one year after program participation for PROGRESA beneficiary households. T-statistics underneath the estimated coefficients provide a significance test relative to the excluded category—households in neither program. Results of these tests from column 1 show that PROGRESA had a significant impact on household behavior relative to the control group—10 of the 12 outcomes are significantly different between treatment and control households and all of the human capital outcomes are higher among beneficiaries. PROCAMPO only households in column 2 are also part of the PROGRESA control group and the results show no difference in mean outcomes between them and the other controls except for investment spending where the difference is in the expected direction. The t-tests beneath the coefficients in column 3 measure the difference between the control group and PROGRESA beneficiaries who also receive PROCAMPO and none of these are significant (although the difference in 13-15 year enrolment is significant at 10

percent), implying that the impact of PROGRESA is very much reduced among the group of households that also receive PROCAMPO.

The results of the pair-wise tests in columns 6-8 are consistent with the idea that mean outcomes are still lower among PROGRESA beneficiaries who also receive PROCAMPO. Column 8 for example shows only one significant difference in mean outcome between the two types of PROCAMPO households (investment spending), while column 6 shows that virtually all differences in outcomes between PROGRESA only and PROCAMPO only households are significantly different. The results in column 7 provide additional insight about the behavioral impact of multiple program participation; these t-statistics test the difference in mean outcomes between PROGRESA only and PROGRESA/PROCAMPO households. The former group has significantly higher total and food consumption (consistent with PROGRESA objectives) but most human capital differences are insignificant except for health check-ups where the PROGRESA only households also display higher mean rates. This latter result is consistent with the theoretical prediction outlined earlier where the higher shadow price of time among agricultural households may lead to a lower compliance with PROGRESA conditionality. Taken as a whole, the results indicate that after controlling for differences in household composition and assets, the levels of food consumption and human capital investment is highest among those households who are not also participating in PROCAMPO. This could be because households in both programs had lower levels of consumption before program initiation. However it may also be due to the conflicting messages delivered by the two programs, differences in shadow prices due to household productive activity, or potential differences in unobserved household characteristics related to participation in PROCAMPO. We now turn to the fixed effects estimates in order to eliminate any potential time invariant heterogeneity related to PROCAMPO participation.

D. Differenced estimates: 1999-1998

Table 5 reports the fixed effects estimates of the same outcomes with program participation captured by dummy variables. These models are run over the sample of households (or children) that report complete information in both survey years, excluding those households who received neither program. The excluded category with respect to program participation in these regressions is households that only receive PROCAMPO. In the framework of equation (14), column (1) is an estimate of β_2 and thus measures the difference between PROGRESA only and PROCAMPO only, while column (2) is an estimate of β_4 and thus measures the difference between PROGRESA only and both programs.

With one interesting exception, the results in column 1 are consistent with those in table 3. PROGRESA only households (column 1) have significantly different changes (relative to PROCAMPO only households) in mean outcomes in 9 of 12 categories including the key outcomes emphasized by PROGRESA (human capital and food consumption); in addition, PROGRESA only households also display a larger change (increase) in the propensity for investment spending (significant at 10 percent). Column 2 reports the estimates for $\beta 4$ from equation (14) which represents differences between households in both programs versus those in PROGRESA only. In this case half of the coefficients are significant at 10 percent or better but the key outcomes of total and food consumption and school enrolment are not statistically significant. This implies that for these key outcomes, the change in level of consumption

between 1998 and 1999 is the same among PROGRESA only and PROGRESA/PROCAMPO households with the important exception of children's health check-ups, where the change is significantly smaller among the latter group. For this particular outcome then, there appears to be a negative interaction effect of participating in both programs, a result which is consistent with the theoretical model discussed earlier.

Table 6 presents the differenced regression estimated using monthly per capita peso values instead of dummy variables for program participation and these are consistent with those in table 5. The coefficient of the interaction between PROGRESA and PROCAMPO ('Both') in column 3 is generally positive although only significant for health/hygiene, investment spending (10 percent) and girls enrolment (10 percent). In these instances therefore, transfers from the two programs are complementary and serve to boost overall consumption. On the other hand, there continues to be a negative interaction between the two programs for health check-ups, where the presence of PROCAMPO leads to lower check-up rates among PROGRESA beneficiaries.

Since the investment and human capital outcomes are dichotomous we also experimented with alternative assumptions about the error term to fit the fixed effects model. Ordered probit specifications produced results similar to those reported in table 6 and are available from the authors upon request. A conditional logit specification was also fit to these differenced dichotomous outcomes and these produced even stronger results than those shown in table 6: positive and significant (at 5 percent) interactions for 12-15 enrolment, girl's enrolment and investment spending and a significant negative interaction for health check-ups.[8]

[8] The conditional logit is identified only through observations that change outcomes over the period since observations that do not change do not contribute to the likelihood function; in these data the conditional logit is thus estimated over a very select sub-set of the sample. These results are available from the authors upon request.

V. CONCLUSIONS AND POLICY IMPLICATIONS

Mexico has been at the forefront in terms of developing innovative programs to combat and alleviate rural poverty in Latin America. The PROGRESA program, initiated in 1997, has taken the continent by storm, and now virtually all governments in the region have either adopted similar programs or are seriously contemplating doing so. Likewise, PROCAMPO represents the first effort by a Latin American country to provide direct cash payments to farmers that is 'coupled' with agricultural production. These two programs have different eligibility criteria as well as somewhat conflicting conditions and messages. The existence of PROCAMPO households in the experimental data used to evaluate PROGRESA provides a unique opportunity to observe the behavioral impact of these two programs among the same group of poor rural households.

The econometric results presented here indicate that mean outcomes (in 1999) for total and food consumption and human capital are clearly lower among PROGRESA households that previously were receiving PROCAMPO after controlling for differences in demographic and asset structure between these two types of households. This difference in overall mean impact is driven by lower outcome levels among PROGRESA-eligible PROCAMPO recipients prior to program implementation. In addition, one year after program initiation PROGRESA only households have significantly higher total and food consumption and human capital outcomes than PROCAMPO only households even though food and total consumption is actually higher among the latter households prior to program initiation. The results also show that while PROGRESA has been able to induce some investment spending, PROCAMPO has not been able to induce human capital accumulation after 4 years of implementation, at least not among this select group of households. Finally, a crucial result is that households in both programs have significantly lower rates of health check-ups than PROGRESA only households, which is consistent with a higher shadow price of time among agricultural households facing market imperfections in the credit or labor market.

The policy implications for PROGRESA type poverty alleviation programs that focus on consumption and human capital investment are clear. In the Mexican case the program has significantly improved the food consumption and human capital accumulation rates of poor households, both relative to a bona fide treatment group but more importantly, relative to a group of households that have been receiving agricultural production subsidies for 4 years. The receipt of both PROCAMPO and PROGRESA is complementary for schooling but not for health check-up rates which are significantly lower among households receiving both programs. These results are consistent with an environment where agricultural households face credit market constraints. Consequently, an important policy conclusion is that PROGRESA-type interventions must pay close attention to other forms of treatment received by participants, especially when they involve potentially contradictory messages and conditions, and should also acknowledge the special constraints faced by agricultural households which may lead to differing (more muted) behavioral responses. In the Mexican case the contrast between consumption and human capital investment versus agricultural production and related investment appears to have reduced the overall effectiveness of PROGRESA among PROCAMPO households along some dimensions and increased it in other dimensions.

The policy implications for PROCAMPO type programs are somewhat more focused. This is because the data we use is from a very select segment of rural Mexican households living in extreme poverty. These households are not typical beneficiaries of PROCAMPO since program eligibility is based on land use and not poverty per se. In addition, it is plausible that these very poor households, living on the brink of existence and employing rudimentary agricultural production techniques, are less able to take advantage of PROCAMPO transfers relative to slightly better off farmers, so that the potential for multiplier effects, crop diversification and other impacts are under-estimated in these data. Indeed positive and significant impacts of PROCAMPO have been estimated elsewhere among more representative households (Sadoulet, de Janvry and Davis, 2001). Nevertheless, among these extremely poor households, PROCAMPO has not led to sustained increases in either household income or human capital accumulation, thus limiting its effectiveness as a poverty reduction tool.

The results from this article raise several interesting questions for future research in the area of rural poverty reduction. One clear direction for future research is to compare the long term effects of PROCAMPO (with a representative sample) on human capital outcomes to see whether a production based intervention can also lead to increases in schooling that are the objective of PROGRESA type programs. On the other hand, the results in this article suggest that PROGRESA has induced investment spending. Another fruitful avenue of investigation would therefore be to explore in a more rigorous way the potential spill-over effects in terms of investment (and eventually income) of a consumption based intervention like PROGRESA. Finally, the issue of heterogeneous treatment effects is a long standing one in the evaluation literature. Results from this article suggest that on-going impact evaluations of PROGRESA type programs in other countries (e.g. Colombia, Nicaragua, Honduras, and Jamaica) should be sensitive to heterogeneous impacts due to multiple forms of treatment and different types of households (agricultural versus non agricultural), to the extent they exist.

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TABLES

Table 1: Means (standard deviation) of Outcomes by Program Status of Household and Survey Year

	1		2		3		4		5	
	Survey year: March 1998									
Expenditures (Logs)	All		PROGRESA only		PROCAMPO only		Both programs		Neither program	
Total	5.004	(0.67)	5.036	(0.69)	4.906	(0.61)	4.876	(0.66)	5.042	(0.65)
Food	4.677	(0.69)	4.706	(0.72)	4.545	(0.63)	4.564	(0.67)	4.723	(0.65)
Health/hygiene	2.527	(1.11)	2.563	(1.13)	2.555	(1.06)	2.342	(1.03)	2.555	(1.11)
School	0.857	(0.92)	0.857	(0.94)	0.889	(0.86)	0.892	(0.87)	0.831	(0.92)
Children's clothes	1.399	(1.13)	1.406	(1.15)	1.387	(1.07)	1.427	(1.11)	1.377	(1.13)
Adult clothes	1.218	(1.14)	1.255	(1.15)	1.226	(1.08)	1.178	(1.12)	1.176	(1.15)
Investment spending (1 if any)	0.451	(0.50)	0.386	(0.49)	0.691	(0.46)	0.757	(0.43)	0.339	(0.47)
Monthly PROCAMPO transfer (pesos)	7.180	(22.02)	-		31.402	(40.63)	27.292	(33.82)	-	
Observations		10318		4887		821		1528		3082
Human capital										
School enrolment (12-15)	0.626	(0.48)	0.630	(0.48)	0.638	(0.48)	0.621	(0.49)	0.619	(0.49)
Observations		7628		3201		807		1510		2110
Health check-up (0-5)	0.825	(0.38)	0.811	(0.39)	0.858	(0.35)	0.855	(0.35)	0.820	(0.38)
Observations		5371		2700		464		950		1617
	Survey year: May 1999									
Expenditures (Logs)										
Total	4.668	(0.61)	4.758	(0.59)	4.467	(0.64)	4.677	(0.60)	4.582	(0.63)
Food	4.324	(0.66)	4.424	(0.63)	4.085	(0.69)	4.307	(0.67)	4.245	(0.67)
Health/hygiene	1.415	(1.02)	1.423	(1.01)	1.358	(1.02)	1.403	(0.95)	1.428	(1.06)
School	0.557	(0.84)	0.557	(0.84)	0.557	(0.84)	0.658	(0.86)	0.504	(0.83)
Children's clothes	1.236	(1.04)	1.346	(1.05)	1.092	(1.00)	1.432	(1.03)	1.005	(0.99)
Adult clothes	1.002	(1.05)	1.062	(1.07)	0.937	(0.99)	1.119	(1.04)	0.866	(1.03)
Investment spending (1 if any)	0.366	(0.48)	0.323	(0.47)	0.550	(0.50)	0.545	(0.50)	0.287	(0.45)
Monthly PROCAMPO transfer (pesos)	6.323	(21.66)	-		25.953	(40.34)	24.862	(35.69)	-	
Monthly PROGRESA transfer (pesos)	22.524	(23.43)	35.263	(19.81)	-		37.372	(20.16)	-	
Observations		9003		4160		778		1396		2669
Human capital										
School enrolment (12-15)	0.498	(0.50)	0.514	(0.50)	0.477	(0.50)	0.552	(0.50)	0.440	(0.50)
Observations		7247		3054		794		1503		1896
Health check-up (0-5)	0.902	(0.30)	0.934	(0.25)	0.874	(0.33)	0.937	(0.24)	0.836	(0.37)
Observations		5852		2749		485		959		1659

Table 2: Means (standard deviation) of Control Variables in 1998 by Program Status of Household

	1		2		3		4		5	
	All		PROGRESA only		PROCAMPO only		Both programs		Neither program	
Demographics										
Females 55+	0.185	(0.41)	0.180	(0.40)	0.238	(0.45)	0.198	(0.41)	0.174	(0.41)
Males 55+	0.188	(0.40)	0.179	(0.40)	0.248	(0.45)	0.224	(0.43)	0.169	(0.38)
Females 35-54	0.421	(0.51)	0.387	(0.50)	0.533	(0.53)	0.538	(0.52)	0.388	(0.50)
Males 35-54	0.452	(0.51)	0.411	(0.50)	0.562	(0.51)	0.563	(0.51)	0.432	(0.51)
Females 20-34	0.588	(0.56)	0.584	(0.55)	0.553	(0.56)	0.565	(0.58)	0.614	(0.55)
Males 20-34	0.503	(0.57)	0.527	(0.56)	0.435	(0.59)	0.459	(0.59)	0.505	(0.56)
Females 15-19	0.292	(0.56)	0.271	(0.54)	0.353	(0.60)	0.366	(0.63)	0.273	(0.54)
Males 15-19	0.285	(0.56)	0.269	(0.55)	0.353	(0.59)	0.365	(0.62)	0.252	(0.53)
Females 11-14	0.368	(0.61)	0.333	(0.59)	0.452	(0.68)	0.433	(0.63)	0.370	(0.62)
Males 11-14	0.386	(0.62)	0.343	(0.59)	0.497	(0.67)	0.522	(0.71)	0.359	(0.60)
Children 5-10	1.304	(1.10)	1.262	(1.10)	1.470	(1.08)	1.423	(1.09)	1.266	(1.10)
Children 0-4	1.004	(0.95)	1.010	(0.95)	0.945	(0.97)	0.967	(0.96)	1.029	(0.94)
Log(size)	1.698	(0.45)	1.654	(0.47)	1.819	(0.41)	1.819	(0.40)	1.675	(0.44)
Assets										
Pigs	1.020	(2.27)	0.864	(2.15)	1.849	(2.58)	1.260	(2.17)	0.926	(2.37)
Cows	0.588	(2.32)	0.482	(2.19)	0.945	(2.61)	0.971	(2.86)	0.471	(2.11)
Oxen	0.072	(0.59)	0.068	(0.55)	0.093	(0.69)	0.116	(0.78)	0.050	(0.51)
Donkeys	0.316	(0.77)	0.278	(0.70)	0.447	(0.91)	0.470	(0.89)	0.266	(0.77)
Goats	0.269	(0.73)	0.202	(0.60)	0.519	(1.03)	0.477	(1.01)	0.206	(0.61)
Land holdings (HA)	1.655	(3.35)	1.222	(2.81)	3.169	(4.04)	3.030	(4.23)	1.258	(3.14)
Irrigated land (HA)	0.039	(0.49)	0.035	(0.52)	0.068	(0.58)	0.073	(0.62)	0.023	(0.29)
Cultivated land (HA)	1.503	(2.97)	1.088	(2.42)	3.029	(3.88)	2.775	(3.96)	1.125	(2.55)
Log(income per capita)	4.909	(0.80)	4.956	(0.81)	4.693	(0.77)	4.720	(0.82)	4.986	(0.75)
Observations	10318		4887		821		1528		3082	

Table 3: Regression Results for Average Effect of Program Status on Outcomes 1998

Dependent Variable	1 PROGRESA	2 PROCAMPO	3 Both	4 R-sq	5 N	6 PROGRESA= PROCAMPO[3]	7 PROGRESA= Both[3]	8 PROCAMPO= Both[3]
Total consumption[1]	-0.022	0.032	-0.021	0.305	10318	0.018	0.968	0.275
	(1.63)	(1.38)	(0.75)					
Food[1]	-0.036	0.002	0.024	0.311	10318	0.106	0.106	0.663
	(2.55)	(0.10)	(0.83)					
Health/hygiene[1]	0.010	0.116	-0.189	0.098	10318	0.014	0.003	0.001
	(0.37)	(2.67)	(3.59)					
School[1]	0.050	0.030	0.000	0.143	10318	0.577	0.369	0.686
	(2.38)	(0.86)	(0.01)					
Children's clothes[1]	0.053	0.031	0.013	0.133	10318	0.612	0.551	0.839
	(2.07)	(0.72)	(0.25)					
Adult clothes[1]	0.084	0.140	-0.079	0.086	10318	0.207	0.021	0.020
	(3.12)	(3.10)	(1.44)					
Investment spending[2]	0.215	1.162	0.178	0.133	10318	0.000	0.798	0.000
	(4.02)	(12.65)	(1.56)					
Enrolment 12-15[2]	0.153	0.056	-0.182	0.126	7628	0.318	0.04	0.249
	(2.31)	(0.57)	(1.52)					
Enrolment 13-15[2]	0.170	0.021	-0.153	0.092	5491	0.172	0.077	0.451
	(2.29)	(0.19)	(1.14)					
Enrolment-boys[2]	0.258	-0.038	-0.137	0.138	3971	0.032	0.091	0.736
	(2.69)	(0.27)	(0.81)					
Enrolment-girls[2]	0.042	0.125	-0.185	0.121	3657	0.550	0.329	0.295
	(0.45)	(0.89)	(1.08)					
Health check-up[2]	0.028	0.012	0.141	0.091	5731	0.922	0.646	0.704
	(0.31)	(0.07)	(0.72)					

Each row represents a separate regression. Only the coefficients for program status are reported (t-statistics in parentheses). All regressions include the controls described in the text (demographic composition, assets, income, prices). 1/ OLS; 2/ Logit estimates; 3/ P-value for test of equality of coefficients.

Table 4: Regression Results for Average Effect of Program Status on Outcomes 1999

Dependent Variable	1 PROGRESA	2 PROCAMPO	3 Both	4 R-sq	5 N	6 PROGRESA= PROCAMPO[3]	7 PROGRESA= Both[3]	8 PROCAMPO= Both[3]
Total consumption[1]	0.171	-0.014	0.038	0.276	9003	0.000	0.000	0.265
	(12.44)	(0.63)	(1.40)					
Food[1]	0.180	-0.042	0.043	0.244	9003	0.000	0.001	0.102
	(11.83)	(1.68)	(1.44)					
Health/hygiene[1]	0.002	-0.037	0.062	0.066	9003	0.337	0.372	0.261
	(0.08)	(0.88)	(1.21)					
School[1]	0.048	-0.021	0.064	0.076	9003	0.040	0.776	0.244
	(2.24)	(0.61)	(1.50)					
Children's clothes[1]	0.316	0.060	0.013	0.208	9003	0.000	0.000	0.573
	(12.93)	(1.50)	(0.26)					
Adult clothes[1]	0.140	0.054	0.001	0.112	9003	0.036	0.041	0.552
	(5.35)	(1.26)	(0.01)					
Investment spending[2]	0.012	0.574	-0.146	0.181	9002	0.000	0.326	0.001
	(0.19)	(5.79)	(1.21)					
Enrolment 12-15[2]	0.302	0.053	0.128	0.234	7247	0.014	0.332	0.738
	(4.08)	(0.50)	(0.99)					
Enrolment 13-15[2]	0.263	-0.084	0.271	0.211	5349	0.004	0.970	0.177
	(3.03)	(0.67)	(1.79)					
Enrolment-boys[2]	0.219	0.070	0.163	0.245	3901	0.284	0.824	0.759
	(2.12)	(0.48)	(0.92)					
Enrolment-girls[2]	0.400	0.027	0.111	0.234	3346	0.015	0.280	0.801
	(3.68)	(0.17)	(0.57)					
Health check-up[2]	1.049	0.027	0.007	0.151	5825	0.000	0.001	0.959
	(8.77)	(0.15)	(0.03)					

Each row represents a separate regression. Only the coefficients for program status are reported (t-statistics in parentheses). All regressions include the controls described in the text (demographic composition, assets, income, prices). 1/ OLS; 2/ Logit estimates; 3/ P-value for test of equality of coefficients.

Table 5: Differenced (Fixed Effects) Regression Results 1999-1998

	1	2	3	4
Dependent Variable	PROGRESA	Both	R-sq	N
Total consumption	0.263	0.038	0.074	5085
	(7.80)	(1.53)		
Food	0.301	-0.010	0.063	5085
	(8.27)	(0.38)		
Health/hygiene	0.131	0.162	0.030	5085
	(2.00)	(3.37)		
School	0.039	0.075	0.024	5085
	(0.75)	(1.98)		
Children's clothes	0.288	0.075	0.027	5085
	(4.59)	(1.64)		
Adult clothes	0.104	0.120	0.024	5085
	(1.52)	(2.39)		
Investment spending	0.049	-0.086	0.051	5085
	(1.64)	(3.90)		
Enrolment 12-15	0.084	0.018	0.024	4467
	(4.51)	(1.15)		
Enrolment 13-15	0.095	0.025	0.030	3118
	(4.08)	(1.41)		
Enrolment-boys	0.066	0.004	0.023	2431
	(2.61)	(0.02)		
Enrolment-girls	0.108	0.023	0.045	2036
	(3.84)	(1.02)		
Health check-up	0.119	-0.047	0.035	4667
	(6.03)	(3.20)		

Each row represents a separate regression; the dependent variable is the change in the indicated variable measured as 1999-1998. Only the coefficients for program status are reported (t-statistics in parentheses). All regressions include the controls described in the text (demographic composition, assets, income, prices) measured in differences. Method of estimation is OLS.

Table 6: Differenced Regression Results (1999-1998) Using Peso Value of Transfer

	1	2	3	4	5
Dependent Variable	PROGRESA	PROCAMPO	Both	R-sq	N
Total consumption[1]	0.003	0.000	0.000	0.068	7343
	(9.07)	(0.14)	(0.46)		
Food[1]	0.004	0.000	0.000	0.058	7343
	(8.64)	(0.66)	(0.25)		
Health/hygiene[1]	0.000	0.000	0.000	0.025	7343
	(0.40)	(0.06)	(2.35)		
School[1]	0.001	-0.001	0.000	0.018	7343
	(1.56)	(0.93)	(0.49)		
Children's clothes[1]	0.006	-0.001	0.000	0.033	7343
	(7.61)	(0.96)	(0.77)		
Adult clothes[1]	0.001	-0.001	0.000	0.032	7343
	(1.79)	(1.32)	(1.11)		
Investment spending	0.000	-0.001	0.000	0.047	7343
	(1.17)	(2.15)	(1.70)		
Enrolment 12-15	0.002	0.000	0.000	0.065	5688
	(9.75)	(0.68)	(1.27)		
Enrolment 13-15	0.002	0.000	0.000	0.069	3971
	(7.90)	(0.30)	(0.22)		
Enrolment-boys	0.002	-0.001	0.000	0.068	3063
	(6.33)	(2.09)	(0.70)		
Enrolment-girls	0.002	0.001	0.000	0.076	2625
	(7.14)	(1.24)	(1.68)		
Health check-up	0.002	0.000	-0.000	0.053	5100
	(7.94)	(0.04)	(2.07)		

Each row represents a separate regression. Only the coefficients for monthly amount received per capita are reported (t-statistics in parentheses). All regressions include the controls described in the text (demographic composition, assets, income, prices) measured in differences. Method of estimation is OLS.

Table A1: Means for School Enrolment Regression 1998

	All		PROGRESA		PROCAMPO		Both		Neither	
Enrolled in school	0.626	(0.48)	0.630	(0.48)	0.638	(0.48)	0.621	(0.49)	0.619	(0.49)
Male	0.521	(0.50)	0.522	(0.50)	0.533	(0.50)	0.542	(0.50)	0.499	(0.50)
Age in years	13.408	(1.12)	13.406	(1.12)	13.404	(1.12)	13.429	(1.12)	13.398	(1.11)
PROGRESA only	0.618	(0.49)	1.000	(0.00)	0.000	(0.00)	1.000	(0.00)	0.000	(0.00)
PROCAMPO only	0.304	(0.46)								
Both programs	0.198	(0.40)								
Demographics										
Females 55+	0.131	(0.35)	0.120	(0.33)	0.162	(0.39)	0.142	(0.37)	0.128	(0.36)
Males 55+	0.167	(0.38)	0.154	(0.37)	0.212	(0.42)	0.191	(0.40)	0.152	(0.37)
Females 35-54	0.672	(0.49)	0.665	(0.49)	0.715	(0.49)	0.721	(0.49)	0.632	(0.50)
Males 35-54	0.699	(0.47)	0.685	(0.47)	0.735	(0.47)	0.721	(0.45)	0.692	(0.47)
Females 20-34	0.443	(0.57)	0.426	(0.57)	0.424	(0.55)	0.438	(0.56)	0.479	(0.58)
Males 20-34	0.318	(0.55)	0.311	(0.55)	0.326	(0.58)	0.339	(0.57)	0.309	(0.52)
Females 15-19	0.528	(0.70)	0.519	(0.69)	0.579	(0.72)	0.583	(0.74)	0.483	(0.68)
Males 15-19	0.558	(0.69)	0.571	(0.71)	0.551	(0.66)	0.567	(0.70)	0.534	(0.68)
Females 11-14	0.773	(0.75)	0.776	(0.74)	0.734	(0.80)	0.706	(0.72)	0.829	(0.75)
Males 11-14	0.826	(0.76)	0.794	(0.73)	0.870	(0.77)	0.917	(0.82)	0.791	(0.73)
Children 5-10	1.596	(1.07)	1.606	(1.07)	1.612	(1.06)	1.578	(1.05)	1.587	(1.08)
Children 0-4	0.862	(0.94)	0.878	(0.94)	0.803	(0.95)	0.833	(0.93)	0.880	(0.94)
Log(size)	1.978	(0.31)	1.967	(0.32)	2.002	(0.30)	2.001	(0.30)	1.969	(0.31)
Assets										
Pigs	1.226	(2.64)	1.040	(2.39)	2.105	(2.90)	1.332	(2.17)	1.096	(3.08)
Cows	0.793	(2.74)	0.683	(2.54)	1.234	(2.85)	1.026	(2.93)	0.623	(2.80)
Oxen	0.105	(0.72)	0.112	(0.70)	0.118	(0.84)	0.162	(1.02)	0.048	(0.33)
Donkeys	0.419	(0.82)	0.379	(0.79)	0.487	(0.86)	0.553	(0.94)	0.358	(0.76)
Goats	0.378	(0.85)	0.271	(0.70)	0.662	(1.01)	0.535	(1.03)	0.319	(0.78)
Land holdings (HA)	2.050	(3.70)	1.542	(3.15)	3.530	(5.10)	3.056	(4.25)	1.535	(3.06)
Irrigated land (HA)	0.058	(0.51)	0.048	(0.43)	0.058	(0.38)	0.104	(0.78)	0.038	(0.39)
Cultivated land (HA)	1.879	(3.49)	1.353	(2.75)	3.401	(5.02)	2.819	(4.10)	1.422	(2.96)
Log(consumption p.c.)	4.744	(0.61)	4.746	(0.64)	4.719	(0.54)	4.691	(0.61)	4.790	(0.58)
	7628		3201		807		1510		2110	

Table A2: Mean for Health Check-up Regressions 1998

	All		PROGRESA		PROCAMPO		Both		Neither	
Child variables										
Health check-up	0.825	(0.38)	0.811	(0.39)	0.858	(0.35)	0.855	(0.35)	0.820	(0.38)
Male	0.491	(0.50)	0.481	(0.50)	0.478	(0.50)	0.498	(0.50)	0.505	(0.50)
Age	1.909	(1.29)	1.896	(1.28)	1.907	(1.32)	1.939	(1.29)	1.915	(1.29)
Household variables										
Mother no schooling	0.239	(0.43)	0.246	(0.43)	0.248	(0.43)	0.238	(0.43)	0.224	(0.42)
Mother some primary	0.431	(0.50)	0.410	(0.49)	0.397	(0.49)	0.477	(0.50)	0.450	(0.50)
Mother primary complete	0.330	(0.47)	0.344	(0.48)	0.356	(0.48)	0.285	(0.45)	0.326	(0.47)
Father no schooling	0.174	(0.38)	0.163	(0.37)	0.149	(0.36)	0.166	(0.37)	0.205	(0.40)
Father some primary	0.469	(0.50)	0.445	(0.50)	0.472	(0.50)	0.546	(0.50)	0.463	(0.50)
Father primary complete	0.266	(0.44)	0.296	(0.46)	0.306	(0.46)	0.204	(0.40)	0.239	(0.43)
Father some secondary	0.090	(0.29)	0.094	(0.29)	0.073	(0.26)	0.082	(0.27)	0.092	(0.29)
Father schooling missing	0.002	(0.04)	0.003	(0.05)	0.000	(0.00)	0.001	(0.03)	0.001	(0.04)
Indigenous	0.406	(0.49)	0.380	(0.49)	0.556	(0.50)	0.484	(0.50)	0.361	(0.48)
<1 km to health center	0.128	(0.33)	0.130	(0.34)	0.086	(0.28)	0.217	(0.41)	0.083	(0.28)
1-3 kms to health center	0.367	(0.48)	0.398	(0.49)	0.381	(0.49)	0.321	(0.47)	0.340	(0.47)
>3 kms to health center	0.505	(0.50)	0.472	(0.50)	0.532	(0.50)	0.462	(0.50)	0.577	(0.49)
Demographics										
Females 55+	0.103	(0.31)	0.088	(0.29)	0.175	(0.39)	0.144	(0.36)	0.082	(0.28)
Males 55+	0.090	(0.29)	0.074	(0.27)	0.170	(0.39)	0.122	(0.34)	0.075	(0.27)
Females 35-54	0.288	(0.46)	0.259	(0.45)	0.412	(0.51)	0.369	(0.49)	0.254	(0.44)
Males 35-54	0.410	(0.50)	0.372	(0.49)	0.545	(0.51)	0.485	(0.51)	0.390	(0.49)
Females 20-34	0.756	(0.48)	0.752	(0.47)	0.716	(0.51)	0.744	(0.50)	0.781	(0.47)
Males 20-34	0.656	(0.54)	0.689	(0.51)	0.547	(0.58)	0.607	(0.57)	0.660	(0.53)
Females 15-19	0.229	(0.51)	0.225	(0.50)	0.287	(0.56)	0.252	(0.55)	0.207	(0.49)
Males 15-19	0.189	(0.48)	0.171	(0.45)	0.274	(0.57)	0.222	(0.50)	0.174	(0.46)
Females 11-14	0.321	(0.59)	0.286	(0.56)	0.453	(0.71)	0.396	(0.62)	0.297	(0.57)
Males 11-14	0.328	(0.59)	0.297	(0.56)	0.420	(0.61)	0.426	(0.67)	0.295	(0.57)
Children 5-10	1.467	(1.11)	1.411	(1.12)	1.739	(1.02)	1.663	(1.09)	1.367	(1.10)
Children 0-4	1.873	(0.77)	1.872	(0.77)	1.931	(0.84)	1.876	(0.79)	1.858	(0.74)
Log(size)	1.843	(0.35)	1.809	(0.35)	1.993	(0.30)	1.939	(0.32)	1.802	(0.35)
Assets										
Pigs	1.109	(2.64)	0.906	(2.01)	2.058	(2.69)	1.386	(2.34)	1.011	(3.52)
Cows	0.532	(2.18)	0.399	(1.51)	0.901	(3.03)	0.921	(3.21)	0.420	(2.04)

	All		PROGRESA		PROCAMPO		Both		Neither	
Oxen	0.060	(0.48)	0.049	(0.32)	0.073	(0.48)	0.120	(0.89)	0.040	(0.30)
Donkeys	0.317	(0.75)	0.269	(0.64)	0.392	(0.78)	0.486	(1.00)	0.276	(0.73)
Goats	0.252	(0.70)	0.198	(0.58)	0.388	(0.77)	0.462	(1.07)	0.181	(0.55)
Land holdings (HA)	1.600	(3.40)	1.070	(2.17)	3.071	(3.14)	3.156	(5.56)	1.147	(3.08)
Irrigated land (HA)	0.031	(0.36)	0.028	(0.25)	0.045	(0.41)	0.060	(0.63)	0.016	(0.26)
Cultivated land (HA)	1.480	(3.19)	1.000	(1.98)	2.901	(2.73)	2.875	(5.27)	1.054	(2.98)
Log(consumption p.c.)	4.973	(0.65)	5.009	(0.67)	4.855	(0.56)	4.870	(0.66)	5.007	(0.62)
	5371		2700		464		950		1617	

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