Program Conditionality and Food Security: The Impact of PROGRESA and PROCAMPO Transfers in Rural Mexico

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Abstract

This paper examines the PROGRESA and PROCAMPO cash transfer programs in Mexico and evaluates their impact on household food security and nutrition. These two programs differ in their targeting and design: PROGRESA is aimed at women and program conditionality is linked to current consumption and human capital investment; PROCAMPO benefits male farmers and program conditionality is linked to agricultural production. The main question addressed by the paper is whether a cash transfer program geared to agricultural production can have the same impact on food security as a cash transfer program geared to consumption through purchases. Our results suggest that monetary payments linked to a productive asset –land– can have as large or larger impact on food security as cash transfers not linked to a productive asset. We show that both programs boost total food consumption and caloric intake in similar proportions. However, increased food security is achieved through different channels – for PROGRESA through purchases while for PROCAMPO through investment in home production. This suggests that the choice of program design depends on objectives beyond total food consumption and caloric intake, such as consumption from specific food categories, diversity of food consumption, investment in agricultural production, and the degree of access to retail food markets.

Keywords: Cash Transfer Programs, PROGRESA, PROCAMPO, Food Security
JEL Classification:I380, Q180

Resumo

Este artigo analisa o PROGRESA e o PROCAMPO, dois programas de transferência de renda no México e avalia o impacto deles em termos de segurança alimentar e nutrição. Os dois programas diferem na focalização e no desenho: o PROGRESA beneficia as mulheres e a condicionalidade do programa está relacionada ao consumo atual e ao investimento em capital humano, o PROCAMPO beneficia os agricultores do sexo masculino e a condicionalidade está relacionada à produção agrícola. A questão principal considerada no

artigo é se um programa centrado na produção agrícola pode obter o mesmo impacto sobre a segurança alimentar que um programa centrado no consumo por meio de compras. Os nossos resultados sugerem que pagamentos monetários relacionados a um ativo produtivo –a terra– podem ter um impacto tão grande ou maior sobre a segurança alimentar do que um programa de transferência de renda não relacionado a um ativo produtivo. O artigo mostra que ambos os programas fortalecem o consumo alimentar e a ingestão calórica nas mesmas proporções. Porém o aumento da segurança alimentar se atinge por canais diversos – por compra de comida no PROGRESA e por aumento de investimento da produção caseira no PROCAMPO. Isso sugere que a escolha de desenho do programa depende de outros objetivos além do consumo alimentar e da ingestão calórica, tais como consumo de certas categorias de alimentos, diversidade da dieta, investimento na produção agrícola e o grau de acesso aos mercados de alimentos por atacado.

1. Introduction

The objective of this paper is to analyze the impact on food security of two cash transfer programs in rural Mexico. Monetary transfer programs are still rare in developing countries, but in Latin America they are increasingly replacing traditional policy instruments for alleviating poverty, food insecurity, and for promoting rural development. In-kind social programs such as school meals and feeding programs for pregnant-lactating women, and other food assistance interventions such as food stamps, input subsidies, livestock protection, price supports, and exchange rate controls have been widely used in developing countries to provide increased resources for low-income households. However, some studies of food subsidization find these to be inefficient in helping the poor improve their nutritional status, and argue that most of the subsidization policies end up benefiting the richest households (Gray (1982); Alderman and Von Braun (1984)). Other studies favor targeted food programs instead of general food subsidies in order to promote effective redistribution of income to the poor (Pinstrup-Andersen 1993). In addition, growing evidence, as well as economic efficiency arguments suggest that a simple income transfer system can provide similar opportunities for the poor to attain nutritionally adequate diets and self-sufficiency with less administrative complexity and less distortions in the economy (Case and Deaton (1998); Sahn and Gerstle (2001)).

PROGRESA and PROCAMPO are interesting examples of social protection interventions. First, they are cash transfer programs, which are still unusual in developing countries around the world, and they represent a large fraction of average total household income. Thus they provide an exceptional opportunity to examine the impact of giving people relatively large sums of money. Second, they are conditional cash transfers, representing a shift in how rural policy is carried out in Latin America. Conditional cash transfers are targeted interventions that stress beneficiary 'co-responsibility' and require specific behavior by the recipients. The two cash transfer programs we examine differ in their gender targeting, with PROGRESA aimed at women and PROCAMPO at producers who are usually men, and program conditionality, with PROGRESA linked to consumption and human capital investment and PROCAMPO linked to agricultural production. Third, they represent two distinct forms of cash transfers that have been implemented in rural areas of a single country: Mexico.

The main questions addressed in this paper are as follows:

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(i) Does program structure (targeting and conditionality) in the provision of cash transfers matter in terms of food security outcomes?
(ii) Can a cash transfer program geared towards production (PROCAMPO) have the same impact on food security as an anti-poverty cash transfer program geared towards consumption (PROGRESA)?

The paper is organized as follows. Section 2 describes PROCAMPO and PROGRESA, Section 3 presents the main research hypothesis, Section 4 describes data sources and econometric approach. Results are presented in Section 5. Conclusions and policy recommendations are provided in Section 6.

2. Cash Transfers in Mexico: PROCAMPO and PROGRESA

2.1. *PROCAMPO*

PROCAMPO was implemented in Mexico in the Winter 1994 agricultural season, following the commencement of NAFTA. The program was designed as a 15-year transition to free trade and is expected to terminate in 2008. 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. This payment is decoupled from current land use and 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 cardamom) that were planted in the three agricultural years prior to and including August 1993. Eligibility was actually given to land parcels and those with usufruct over these land parcels, not particular 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.

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, which cannot exceed the amount of land registered in the eligibility roster. [1]

Farmers must prove that the parcel is currently under production, but monitoring of actual planting is haphazard, and many devices are employed to skirt this requirement. However, given that the program is based on past agricultural production and the requirement that farmers continue producing or participate in an official environmental management program, the intervention is closely and intentionally linked to agricultural production.

[1] Fallow land does not merit payment.

Each season after planting, farmers must go to one of the 700 CADER (Center for the Assistance of Rural Development) offices around the country with proof of planting to solicit their payment. Payments are in the form of checks distributed at the CADER offices and, in 1997, averaged US$329 per recipient and US$68 per hectare. An additional benefit to farmers of participating in the program is that PROCAMPO qualification certificates can be used as collateral for borrowing from commercial banks and input retailers, although often at very high interest rates. PROCAMPO covers 95 percent of the cultivated area in Mexico that had been planted in corn, beans, sorghum and wheat. It covers on average 14 million hectares of land each year, reaching almost three million producers and providing payments in 1998 of US$919 million (Sagar 1998). PROCAMPO is particularly important in the ejido (land reform) sector where 84 percent of ejiditarios participated in PROCAMPO and received payments for, on average, 5.2 hectares. Since PROCAMPO is distributed on a per hectare basis, larger farms have tended to get higher total transfers; for example, households with less than 5 hectares make up 45 percent of recipients but receive only 10 percent of total transfer payments (Sagar 1998). However, since PROCAMPO provides a uniform payment per hectare regardless of yield or crop sales, it tends to 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).

2.2. *PROGRESA*

PROGRESA was initiated in Mexico in 1997 as a mechanism for addressing extreme poverty in rural areas. Although a cash transfer program, a primary thrust of PROGRESA is to develop the human capital of poor households by improving education, health and nutrition outcomes. Households are required to visit health care clinics and send their children to school in order to maintain eligibility. Transfers 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. The gender targeting of the program is one of many mechanisms geared towards improving health and education outcomes.

Because PROGRESA targets poor households, criteria were developed for determining eligibility based on household well-being. This selection of eligible households was done in three stages (see Skoufias et al. (1999). First, potential recipient communities were identified as poor communities based on an index of marginality developed from the national population census. This marginality index was constructed 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. After communities were identified, the second step was to select households for participation in PROGRESA based on data collected from a household census

within the community. A proxy means test was calculated for each household using discriminant analysis and households above the cut-off point were selected as beneficiaries.

By the end of 1999, PROGRESA provided bimonthly transfers to approximately 2.6 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 governments budget allocation for poverty alleviation. Average payments to beneficiary households in 1997 were substantial, representing 29 percent of average per capita income of beneficiaries. Because PROGRESA links payment of transfers to 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.

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

3. Hypothesis

In this section we present some hypotheses about why we might expect PROCAMPO and PROGRESA cash transfers to lead to different outcomes in terms of food security. There are at least four reasons why we might expect that income from these two programs is used differently by the recipient household. Though we are not always able to disentangle the role of each hypothesis, and do not aim at evaluating them separately, each one holds *ceteris paribus*, and may have an effect on the different outcome of the two programs.

3.1. *Gender*

One of the most important differences between the two programs is that over 90 percent of PROCAMPO beneficiaries are men while PROGRESA is directly targeted to women.[2] The reasons for this targeting strategy stems from the increasing evidence in the development literature that females spend income differently than men. In particular, women are more likely to spend own-earned income on nutrition and children's health and education while men are more likely to divert income towards wasteful consumption, such as tobacco, and alcohol.

For instance, Duflo (2003) finds that pensions received by women in South Africa had a large impact on the anthropometrical status of girls; in contrast no effect on the nutrition status of household children is found for pensions received by men.

[2] Males may be PROGRESA beneficiaries when no adult female is available. This occurs in approximately 1 percent of the households in this sample.

Thomas (1990) for Brazil shows that more income under the control of women leads to greater health and nutrition related expenditures. On the other hand, Hoddinott et al. (1995) report that in Cote d'Ivore expenditure on alcohol and tobacco are positively related to the share of income that goes to men. In addition, these gender differences in the allocation of income seem to be especially relevant among poor households (Kennedy and Peters 1992), such as those in our sample. Similar conclusions are drawn when the allocation of resources by female and male-headed households is examined (Handa (1994); Kennedy and Peters (1992)).

Since the allocation of transfer income depends on the gender of the transfer recipient, we expect PROGRESA and PROCAMPO transfer payments to have a different impact on food security. Based on the literature summarized above, the initial hypothesis is that PROGRESA will lead to a larger increase in food expenditure and caloric intake because it is directed to women.

3.2. *Investment*

Another key difference between PROGRESA and PROCAMPO is that the latter is linked to the use of a productive asset, land, while PROGRESA – in the short run on which our analysis focus – is not. By linking transfers to productive assets, multiplier effects out of productive investment are expected. This is likely to be important if the household is credit constrained, as it is generally the case in poor, rural Mexico. Another difference is that PROCAMPO payments can be used as collateral against which to borrow money. If PROCAMPO transfers actually relax the household credit constraints, this can potentially create further multiplier effects. Other studies of PROCAMPO have indeed found these multiplier effects (Sadoulet et al. 2001). Thus, benefits to future income and consumption of these multiplicative effects can be substantial.

Hence, our initial hypothesis is that PROCAMPO will have a greater impact on food security through agricultural investment, while the impact of PROGRESA through agricultural investment will be limited given the consumption-based nature of the program. If producers invest transfers and spend profits, PROCAMPO might not have a large initial impact on consumption but a large medium or long term impact on consumption. Our period of analysis –1998– is the 4^{th} year of the PROCAMPO program so we are probably able to capture some of these longer term impacts on consumption if they exist.

The investment effect of PROGRESA and PROCAMPO on food security can be stated in terms of a short run-long run trade off, as well as in terms of a productive-human capital investment tradeoff. If PROCAMPO beneficiaries invest transfers, PROCAMPO is likely to have a limited short-run impact on food security outcomes, but a larger long-run impact. In contrast, PROGRESA is likely to have a bigger immediate effect on food and calorie consumption. PROGRESA also has a long-run dimension, which comes from the build up of human capital. The long run in this case is generational, and an evaluation of the long-run impact

of PROGRESA is beyond the scope of this paper. Given the period of analysis and the dates when the two programs started, our hypothesis is that the observed impact of PROCAMPO will be larger than the observed impact of PROGRESA on food security because the PROCAMPO effect includes the multiplier effect from long-run productive investment which is the focus of that program.

3.3. *Quantity versus quality*

There is a debate in the development literature on the extent to which nutrition responds to income. One view is that economic growth and rising per capita income will lead to better nutrition and eventually eliminate malnutrition among the poorest. Subramanian and Deaton (1996) find calorie elasticities around 0.3-0.5 which partially support this view; Strauss (1986) finds an estimate as high as 0.9 for rural Sierre Leone which would imply that cash transfer policies might be highly effective at reducing malnutrition. However some authors have questioned these findings and conclusions. Berhman and Wolfe (1984)), Berhman and Deolalikar (1987) and Bouis and Haddad (1992) find that the calorie elasticity with respect to income is close to zero, even in populations with considerable malnutrition, so that increases in income would not result in substantial improvements in nutritional intakes. Similarly, Butler et al. (1985), using data from the Food Stamp Cashout Project, find no significant increase in nutrient intake as income increases.

For policy purposes both the total impact of a program and the mechanism through which that impact is achieved are important. There are two mechanisms through which rural poor households in Mexico can reduce their food insecurity: purchases and home production. Households can either use the cash payments to acquire calories from the market, or can invest them in their land to increase home production and consumption. If PROCAMPO requires that farmers continue to use their agricultural land for crops or livestock it is more likely that the payments are invested in the land or in the creation of household assets, which would stimulate home food production and consumption. If no such requirement exists for PROGRESA payments, and if the *platicas* provide better access to the market through information, we can expect PROGRESA beneficiaries to increase their food security through purchases.

4. The Empirical Approach

4.1. *Data*

The data used for the analysis were collected as part of the PROGRESA evaluation. In the second wave of expansion of the program (late 1997) 505 communities were selected to participate in the evaluation, and one-third of these were randomly selected for delayed entry into the program in order to serve as the control group for the social experiment. In both treatment and control communities,

households were divided in eligible and not, through a proxy means test of poverty. Initially, the 52 percent most poor were considered eligible. In a second phase, the eligible group was expanded to cover about 78 percent of households, through a process knows as *densification*, which led to the inclusion of poor families with older members and no children. As the latter group started receiving transfers later, and has different characteristics, we limit our analysis to the households initially defined as poor and eligible. *Densificados* and non-poor households are excluded from our sample.

The data we use are the baseline survey (ENCASEH) which was conducted in late 1997 among all communities to be incorporated in the second wave of expansion to determine household program eligibility, and the post-treatment survey on the evaluation sample of households conducted in October 1998 (ENCEL98O). By this time, beneficiaries had been receiving transfers from PROGRESA for about seven months (as payments began in April 1998) and from PROCAMPO for about four years.[3] While the objective of the evaluation was to measure the impact of Progresa, the survey also collected information on whether the household participated in PROCAMPO, and the amount of transfer income received from that program. Hence we have a unique data set of poor rural households with a significant participation in these two important cash transfer programs. Our sample of households can be divided into four groups: PROGRESA recipients only (44.2 percent), PROCAMPO recipients only (9.4 percent), PROGRESA and PROCAMPO recipients (19.1 percent of all households), and non-recipients (27.3 percent). The number of observations in each group is reported at the top of Table 1. Households in groups 2 and 4 are eligible for Progresa but are located in the control communities. Overall, 63.3 percent of the sample receives PROGRESA, 28.5 percent receive PROCAMPO and 72.7 percent participate in at least one program.

4.2. *Empirical specifications*

Our objective is to analyze the effect of PROGRESA and PROCAMPO transfers on a set of food security indicators which include food consumption in monetary terms, caloric availability and food diversity. In addition we seek to understand the mechanism through which households achieve food security and so specifically explore whether program participation leads to more home production or cash purchases. These measures are a function of transfer income, non-transfer income, prices, and preferences. Since our focus lies on comparing the effects of PROGRESA and PROCAMPO and not the direct effect of earned income on food security, and since earned income is endogenous, we include an exhaustive set of exogenous

[3] Following the October 1998 survey two additional ENCEL surveys were conducted in March and October 1999. Results from the evaluation of PROGRESA show that the main impact of Progresa in terms of schooling, health, and consumption is found after the initial 6 months of the program (October 1998). After that, the impact does not get bigger, and in fact in some cases, is reduced. In addition, PROCAMPO households in ENCEL October 1998 have been in that program for 4 years and so we assume that the long term benefits (multiplier effect) of PROCAMPO are fully realized by this time.

variables that we expect would explain variations in earned income among households. These variables include measures of human capital and household assets as well as regional dummies which control for regional differences in the ability to generate income that are that are linked to infrastructure, public services, etc. A number of these variables, particularly age and gender of the head of household, whether the household is indigenous, and education levels, may also reflect differences in preferences across households. However, distinguishing the effects of earned income and preferences on food consumption and caloric intake is not the main concern of this study – it is sufficient for our objective that we control for variations in these factors across models in order to isolate the net impact of program transfers on food security. Note that the control variables come from the 1997 baseline survey while the expenditure and transfer data come from ENCEL98O.

4.2.1. *Food consumption*

We estimate the following linear form of the Engel curve for food expenditure:

Berhman and Deolalikar (1987, 1989) present estimates for a poor Indian population that indicate that, although income elasticities of food expenditure are large, income elasticities of calorie intakes are much smaller. This finding suggests that individual weigh food attributes other than calorie content when they make their food choices in response to income changes. That is, people substitute quality or diversity for quantity as income rises. The income elasticity of the average price paid per calorie has been used as a proxy for food quality. Estimates of this elasticity have been found to be positive and not trivially small even for very poor households (Gray (1982); Berhman and Deolalikar (1987)). Thus, if non-nutritive food characteristics – taste, appearance, status, and degree of processing – are favored highly at the margin, then income increases will not alleviate malnutrition nearly as much as the World-Bank (1986) and others have claimed.

To understand the various ways households respond to increased income we study whether PROGRESA and PROCAMPO cash transfers increase diversity in the composition of the food basket, and in particular, whether increased income leads to the purchase of more vegetables and meat, or to the purchase of more expensive but less nutritive products such as processed foods. Our initial hypothesis is that PROGRESA will increase diversity through program information and a higher propensity to purchase calories, while PROCAMPO might not increase diversity since calories are more likely to be obtained through home production. PROGRESA beneficiaries are required to attend lectures, *platicas*, where information and training on education and nutrition are given by a doctor or a nurse from the health clinic serving the community. It is widely recognized that poor nutritional status can be caused not only by insufficient intake of calories, but also by a diet that is insufficiently diverse. The information and training given at the *platicas* might lead recipients to increase their vegetable and meat intake thus improving their overall diet and ultimately nutritional status. Since PROGRESA recipients are more likely

to obtain calories through purchases and market offers a wider range of food products than home production, this might also increase the likelihood of eating a more varied diet. Of course access to and reliance on the market might increase diversity in an undesirable fashion through increased purchases of non-nutritious items such as cookies and soft drinks. In contrast, PROCAMPO money is more likely to be invested in home production which consists predominantly of grains and cereals – the basis of the diet in rural Mexico.

4.3. *Mechanisms for achieving household food security*

$$F_i = \beta_0 + \beta_1 PROGRESA_i + \beta_2 PROCAMPO_i + \beta_3 X_i + \epsilon_i \qquad (1)$$

where F_i is monthly per capita[4] food consumption of household i, and $PROCAMPO_i$ are monthly per capita payments from the two transfer programs, X_i is a vector of socio-economic characteristics of household i, including regional dummies, and a price index, and ε_i is the error term. All consumption measures and transfer values discussed in this paper refer to October 1998 and are expressed in constant (1997) pesos.

An interaction term between the two program transfers was initially added to the specification but not found to be significant. While both double log and linear functional forms are found in the literature, we opt for the linear one because we are directly interested in marginal propensities to consume out of different sources of income. Case and Deaton (1998) and Duflo (2003) use linear models to compare transfer and non-transfer income, and linear models are the norm in the food stamps literature where the objective is to compare the marginal propensity to consume out of different sources of income (food stamps and cash).

As explained in the previous section, both consumption and the transfers from PROCAMPO and PROGRESA refer to October 1998. The estimate of the coefficient β_1 will give the short term marginal expenditure out of every additional *peso* paid by PROGRESA, and β_2 the medium-term (after about four years) marginal expenditure out of every additional peso paid by PROCAMPO[5] (as in Sadoulet et al. (2001)). All other regressors refer to 1997, in order to avoid endogeneity, and proxy household income and preferences.[6]

[4] All per capita measures in the paper (consumption expenditure, calories consumed and transfers) are adjusted per adult-male equivalent. Household size in adult-male equivalent persons is actual household size adjusted for the age and sex of the household members. The adjustment procedure weights each household member by the nutritional requirements of an adult male age 23-50. This measure of household size is further adjusted to account for household members not eating at home, and guests.

[5] PROCAMPO transfers are not constant across time, as households can rent and buy land entitled to program benefits. Furtheremore, households can decide not to grow crops in a given year or discontinue authorized environmental programs, interrupting this way the flow of payments.

[6] One exception is made for land. In fact, in the Encaseh 1997 survey, all land plots below one hectare of size were recorded as measuring one hectare. This greatly reduces variability, as most plots have small size. More precise information is in this case drawn from the Encel survey of October 1998. As will be explained in the section on identification, land and PROCAMPO transfers will not convey the same information, as not all land plots are entitled to the program, and sufficient variability across land

To determine if the impact of a PROGRESA peso is different from a PROCAMPO *peso* we test whether $Ho : \beta_1 = \beta_2$. A failure to reject this hypothesis would imply that the marginal propensity to consume food out of PROCAMPO is the same as the marginal propensity to consume food out of PROGRESA. However, this does not necessarily imply that the conditions and eligibility requirements in the provision of cash transfers do not matter. The mechanism through which increased consumption is achieved, which is determined by program conditionality and the gender of the recipient, is still important. Failure to reject the null hypothesis may occur even when the programs have very different behavioral impacts which are important for policy. On the other hand, a rejection would clearly indicate that eligibility requirements (gender of the recipient) or/and conditionality in the provision of cash transfer matter.

In addition to (1), we also estimate equations for 4 types of foods (fruits and vegetables; grains and cereals; meat and other animal products; other food) to see whether program participation affects the composition of the food basket. Finally, we repeat the entire set of estimates using budget shares instead of levels to see how transfer income affects the distribution of the budget across categories of foods.

4.3.1. *Caloric availability*

As noted above, foods may be purchased for many reasons aside from nutrition convenience, pleasing tastes, appearance, taste for variety, etc. To see if transfer income leads to increased caloric availability we estimate the following model:

$$Cal_i = \beta_0 + \beta_1 PROGRESA_i + \beta_2 PROCAMPO_i + \beta_3 X_i + \epsilon_i \qquad (2)$$

where Cal_i is number of kilocalories available per person per day in household i. We are not only interested in whether transfer income contributes to increase the caloric intake of these poor households, but also in whether there are shifts across food groups, for instance from foods with high caloric content towards foods which are more expensive but not as nutritive so we also estimate equation (2) in share form.

4.3.2. *Variety*

No standard definition of measurement or optimal level of food diversity exists in the literature, and food diversity can be quantified in a number of ways. One possibility depends only upon whether or not any of each food is consumed, or upon the number of commodities consumed within a broad commodity group. An alternative approach to measuring variety is through diversity indices, which take into account not only whether or not each food is consumed, but also the relative magnitudes of each food consumed. We use the number of foods purchased, as well as three diversity indices which have been widely used in economics and biology:

holding and program transfers is observed.

$$\begin{aligned} \text{Simpson index}^{7} &= 1 - \sum \Pi_i^2 \\ \text{Shannon index} &= -\sum_i \Pi_i \log(\Pi_i) \\ \text{ROD index} &= 1 - \sum_i (\Pi_i - \omega_i)^2 \end{aligned} \tag{3}$$

where Π_i is the calorie share of food $i(i = 1, 2, ...36), \omega_i$ is the average calorie share of good i consumed by the top decile of the distribution of per capita total income (measured as total consumption). If only one food was consumed, the first two indices would be zero hence variety increases with the index value. The ROD (Revealed Optimal Diversity) index, which is of our own invention, equals one in the case of optimal diversity, which is assumed to be the average consumption basket of the top decile households. Equal shares of two different goods are weighted equally in these indices. However one might want to weight processed foods, for instance, differently from the rest of foods. This is based on the view that increasing diversity towards more varied vegetables, meat and fish is better than expanding the consumption basket towards sodas, cookies, and alcohol.

In addition to the above analysis, we estimate a series of probit regressions to estimate the impact of each program on the probability of consuming new foods not previously consumed. The motivation of this approach is to see whether program participation increases the number of foods irrespective of the amount consumed of each food. The estimated model is:

$$P(C(j)_i) = \beta_0 + \beta_1 PROGRESA_i + \beta_2 PROCAMPO_i + \beta_3 X_i + \varepsilon_i \tag{4}$$

where $P(C(j)_i)$ is the probability of consuming food j or group j of foods by household i and X is the usual vector of control variables.

4.3.3. *Mechanisms of acquiring calories*

There are two basic mechanisms of increasing caloric availability: purchases through the market and investment in home production. The ENCEL98O survey gives us information about how much households consume out of home production so we are able to estimate how sensitive this type of calorie consumption is with respect to the two cash transfer programs under analysis. The econometric strategy used in this case is a two-step Heckman selection model because not all households consume out of home production and this selection is not random. We believe that what determines whether we observe this consumption or not is, among other things, ownership of land, cattle, and agricultural machinery. The participation or selection equation therefore includes a dummy for owning land, the number of pieces of land owned, number of animals for agricultural work (horses, oxen, and mules), and ownership of agricultural machinery (tractor, plumb, etc.). We estimate equation (3) but using only calories from home production as the dependent variable, and including the selection correction term derived from the first stage probit regression predicting the probability of consuming out of home production.

4.4. *Identification of program impact*

The experimental design of the sample allows a clean identification of the Progresa program on beneficiaries. Since we want to go beyond a mean treatment effect and quantify the impact of each peso received by the household, we construct the amount of money each participant household should receive based on their family size and children's schooling situation. This estimator is the same as the intent-to-treat (ITT) that is commonly used in the evaluation literature, and is appropriate provided that program take-up is nearly universal (Bloom 1984), which it is in the Progresa program.

Identification of the true 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. Moreover, since PROCAMPO eligibility is based on land use we are concerned that the OLS estimator of PROCAMPO might be picking up the true program effect combined with a land effect, and therefore be biased upwards.

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 uses of land (for example authorized environmental programs) indicating that in general there not a direct one-to-one relationship between growing staples and participating in PROCAMPO. Identification of the program effect would therefore come from all those households that are similar in all relevant characteristics to PROCAMPO recipients (and in particular, have the same type of land) but do not receive the PROCAMPO transfer because they began growing the eligible staples after the eligibility roster was fixed or because they bought new land after 1994. If among these 25% 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.

An alternative strategy to deal with the potential endogeneity of PROCAMPO is through instrumental variables. The difficulty in this approach is identifying valid instruments that adequately predict PROCAMPO transfers and that are uncorrelated with the error term in the main regression. Three variables – the number of mules, the number of oxen, and the non-self village mean value of PROCAMPO transfers – pass the test for over-identifying restrictions. The validity of these instruments is based on the maintained assumption that their impact on the outcome variables, food expenditure for example, only occurs through the level of PROCAMPO transfers. Based on these instruments we performed exogeneity

tests using the method suggested by Hausman (1978) for the OLS equations and Smith and Blundell (1986) for the probit equations (full results of this analysis is available upon request). In most cases the hypothesis of exogeneity is not rejected by the data, suggesting that the standard regression model is appropriate. We present results for both the standard model and the instrumental variables model as well as the results of the test of exogeneity in the discussion below.

5. Results

5.1. *Descriptive statistics*

Table 1 summarizes the data on per capita consumption, cash transfers, household characteristics and regional differences that are used in the regression analysis. The vector X is made by the following variables:

• Household demographic characteristics – household size, age and gender of the head, ethnicity (proxied by speaking an indigenous language), composition by gender and age (expressed in shares);
• Human capital – measured by shares of adults with different educational degrees, by gender;
• Material assets – proxied by the quality of the dwelling (paved or dirt floor, access to water and electricity);
• Agricultural assets – size of land, divided in irrigated and not, pasture and forests; number of cows and pigs;
• A community level price index;
• Geographical location – expressed by seven dummies for different agro-climatic areas.

In the first column, data from the entire sample is presented while the remaining columns report the results for the four household categories. It is expected that PROGRESA (categories 1 and 3) and non-PROGRESA (categories 2 and 4) households will have similar characteristics as treatment and control communities were chosen randomly. PROCAMPO participation is not randomly assigned in the survey so some differences between PROCAMPO (categories 2 and 3) and non-PROCAMPO (categories 1 and 4) are expected to emerge. PROGRESA transfers are on average between three and four times greater than PROCAMPO transfers. For PROGRESA recipients, the transfer represents about 23 percent of total monthly expenditure while for PROCAMPO recipients the transfer represents less than 10 percent of total expenditure; both of these programs represent significant contributions to household income.

The PROCAMPO households, split into categories 2 and 3, appear to have different characteristics compared to categories 1 and 4. PROCAMPO households have much larger land and livestock holdings and they participate less in

non-agricultural wage labor. On average PROCAMPO households are larger than non-PROCAMPO households and are further along in the life cycle, with older household heads. All four categories have similar levels of infrastructure such as electricity, piped water and dirt floors in their dwellings. These results indicate that there are some differences between the PROCAMPO households and other households while PROGRESA households seem to be similar to non-participant households; this is not surprising given the sampling framework.

5.2. *Food consumption and consumption shares*

Food consumption represents the most important expenditure category, making up around 80 percent of total household expenditure. Households report the monetary value of food consumption and the quantities of the individual food items used during the seven-day period preceding the interview. The price of food is obtained by dividing the monetary value of food consumption by the quantity of each food item used. Food not purchased directly by the household (i.e. home-produced food) is valued at the average community price paid by the households reporting its purchase. The total money value of food used at home is obtained by summing the money values of the individual food items.

Table 2 reports mean values of per capita monthly consumption in pesos and consumption shares of the main food categories for all households and the four household types.[8] There are significant differences in the unconditional means across PROGRESA and PROCAMPO households. These households are not comparable in terms of total wealth and other characteristics, so only some of these differences are due to program effects. The mean value of food consumption for PROGRESA recipients is 143 pesos per person per month compared to 125 pesos for PROCAMPO beneficiaries, a difference of 14 percent. It is noteworthy that grains and cereals account for more than half of all food consumption. Recipients of both programs are relatively similar to PROGRESA recipients. Households that received no transfers are relatively more similar to PROCAMPO recipients.

Table 3 presents the results of the regression on total food consumption and for each individual food consumption category. Both OLS estimates (using actual PROCAMPO transfer values) and IV estimates are presented. The test of overidentifying restrictions, as well as a Hausman exogeneity test is shown. For each regression, Table 3 also includes results of the test of the hypothesis that the PROCAMPO and PROGRESA coefficients are equal. Only the estimates corresponding to the transfer variables are presented in this table (full estimation results are available from the authors upon request). The discussion is based on the OLS results as long as the Hausman exogeneity test fails to reject that PROCAMPO is exogenous, otherwise IV estimates are discussed; estimates that apply in each case are presented in a bold font.

[8] The Other Food groups includes: oil, sugar, coffee, cookies, soda, and alcohol.

The estimate of the marginal propensity to consume food out of PROGRESA is 0.31 and the corresponding estimate for PROCAMPO is 0.33. Both of these estimates are different from zero at one percent significance level and are not significantly different from each other. While indicating that the marginal impact of the programs on food security is the same, the way in which food security is achieved may be very different between the programs.

The results for specific food groups indicate that the IV estimates are appropriate for meat and other foods. The MPC for vegetables and fruits out of the two cash transfers is small, though significantly different from zero. Transfers have a larger impact on grain consumption, with a peso increase in either PROCAMPO or PROGRESA triggering an increase in the consumption of grains between 0.12 and 0.15 pesos but in none of these cases we observe significant differences between the two programs. On the other hand, tests of difference between PROCAMPO and PROGRESA coefficients indicate that the null hypothesis that they are equal can be rejected for meat (3 percent significance level) and other food (7 percent). The most noteworthy difference emerges when we evaluate the impact on meat consumption. An additional peso of PROCAMPO would increase meat consumption by 0.6 pesos, while a peso of PROGRESA generates an increase of less than 0.1.

The estimates based on shares are presented in Table 4 and indicate that PROGRESA recipients shift income towards vegetable and meat consumption and away from grains and other food. This is a pattern displayed by most rural households in developing countries as income increases. PROCAMPO has no significant impact on the vegetable or grains share but it shifts a large fraction of income from the other food category towards meat and other animal products and this shift is significantly different from PROGRESA.

5.3. *Caloric availability and calorie shares*

Table 5 reports mean values of calorie consumption and calorie share by food categories for all households and for the four recipient types.[9] Caloric availability is constructed using conversion factors reported in Las Tablas de Valor Nutritivo for Mexico (Chavas 1999). We estimate caloric availability based on household averages, as this is how the data were reported.[10] The average nutrient intake for the households in our sample is 2126 Kcal per person per day and the median household is getting 1895 Kcal. The minimum dietary energy supply for Mexico is set at 1890 Kcal per person per day and any intake below 1680 Kcal is considered undernourishment; based on this we estimate that about 40 percent of our sample

[9] We have excluded households reporting no food was consumed, or households with caloric availability per person per day less than or equal to 875 kcal or greater or equal to 5000 kcal. WE also exclude those who reported having a party, or that consumed more than 2000 kcal of oil or lard.

[10] This might be misleading if the distribution of inputs among the individuals in the household is not uniform. In this case, average household nutrient demand relations would not very useful to predict what happens to nutrient intakes for a given member in the household if household income increases.

is malnourished. PROGRESA recipients have, on average, 2.8 percent more calories available per person per day than do households receiving PROCAMPO only. The difference is particularly big for vegetable calories. PROGRESA households consume on average 19 percent more calories from vegetables and 11 percent more calories from meat and animal products than PROCAMPO recipients. Those receiving both programs do not consume more calories on average than households receiving only one program; these households are poorer than those receiving PROGRESA only.

Grains provide cheap calories and so they weight more in the calorie share (74 percent) than in the consumption share (51 percent). At the other extreme, vegetable calories are the most expensive accounting for 2 percent of total caloric availability and 15 percent of the food budget. The grain share of calories for PROCAMPO households is nearly 4 percent higher than the corresponding share for PROGRESA recipients. However calories from vegetables and meat account for a much smaller fraction of caloric availability in PROCAMPO households. These differences might be connected to these households' dependence on home production for example.

Table 6 summarizes the results for the estimation of total calories as well as calories derived from each of the food categories. A peso from PROGRESA leads to a unit increase in total calories per person per day in the household while a PROCAMPO peso increases total caloric availability by 2.8. However the standard errors of these estimates are quite high, so that they are only significant at the 10 percent level and not significantly different from each other. As in food consumption, statistical differences between the programs emerge when we explore the impact on the individual food categories. PROCAMPO has a significantly larger impact on calories consumed from vegetables than PROGRESA; this result, together with the result in Table 3 that the marginal effects of PROCAMPO and PROGRESA on vegetable expenditure are the same, suggest that PROGRESA recipients are paying more for each additional calorie from vegetables. The opposite is true for meat consumption: a peso from PROCAMPO has a larger impact on meat expenditure than a peso from PROGRESA but no differences are found for caloric intake. The F-test also rejects the null hypothesis of equality of the two coefficients for the other food category. PROCAMPO actually has a large and negative impact on calories acquired from these foods, while PROGRESA leads to more calorie consumption out of them. These results tend to suggest that the programs lead to different behavioral responses from beneficiaries.

How responsive are food expenditures and caloric availability with respect to transfer increases? This question is relevant when we are interested in exploring whether households display a taste for variety or whether there exists a so-called tradeoff between quality and quantity. We have estimated food and calorie elasticities from income from each program using a double-log specification (results available from the authors upon request). The calorie elasticity with respect to PROGRESA transfers is half as large as the corresponding food expenditure elasticity while in the case of PROCAMPO the size of the calorie elasticity is

70 percent the size of the food elasticity, indicating that PROGRESA recipients are more likely to substitute quality for quantity. It is interesting to observe this pattern even among relatively poor and food insecure households.

Table 7 presents estimates of the regressions on calorie shares; these suggest that both programs contribute to increase the share of vegetables and meat in total caloric intake, reducing the share of grains and other food. PROCAMPO has a statistically significant effect and statistically different from PROGRESA in increasing the vegetable share and in reducing the other food share.

5.4. *Diversity analysis*

Earlier in the section we saw that PROCAMPO and PROGRESA increase the value of food consumption. Now we focus on the possibility that this change comes about because of the consumption of new foods not previously consumed. Table 8 displays the percentage of households not eating certain foods or food groups by program status. These indicate that PROGRESA households are more likely to be eating fruits and vegetables, dairy products, meat and fish, but also processed foods. The probit (and IV-probit) regressions estimates presented in Table 9 suggest that PROGRESA (but not PROCAMPO) increases the likelihood of eating vegetables and fruits; on the other hand PROCAMPO has a large impact on the probability of eating meat and fish and this is statistically different from the effect of PROGRESA transfers.

We do not find any evidence that supports that one program has a larger impact than the other on the probability of eating more dairy products and processed foods. All this suggests that the two programs are contributing to increased variety, understood in this case as the likelihood of eating more foods not previously consumed. Since it is widely recognized that poor nutritional status can be caused not only by insufficient intake of calories but also by a diet that is insufficiently diverse, the observed shift can be considered beneficial.

Table 10 shows the mean value of the total number of total foods consumed, the number of different types of food within each sub-group, and the means for the diversity indices while Table 11 presents the results of regressions of the number of food and the diversity indices on PROCAMPO, PROGRESA and our usual control variables. The results indicate that both programs have a positive effect on variety, measured by the total number of foods consumed. However, there are no statistical differences between the two programs. We expect the lectures on nutrition and health given to PROGRESA beneficiaries to have a larger impact on diversity for these cash transfer recipients but we do not find any evidence of this in the data (relative to PROCAMPO households). Regressions using other, less conventional measures of diversity, represented by the Simpson index, the Shannon index and the ROD index, confirm that the programs contribute to increase variety.

5.5. *Calories from home production*

Finally, we are interested in examining the mechanism through which PROGRESA and PROCAMPO contribute to increased food security, whether it is through home production or through purchases. Table 12 presents mean values of the shares of calories consumed from home production. On average, 30 percent of all calories consumed come from home produced food. PROCAMPO households are very dependent on home production, in particular for grains. Over 52 percent of all grain calories they consume come from home produced grains. Though not shown in the table, it is noteworthy that most of home production consists of grains, followed by vegetables.

Table 13 presents the results of the Heckman selection model estimated for calories from home production. As mentioned earlier we implement a Heckman selection model to deal with the fact that not all households consume out of home production. We believe that consumption out of home production is related to land, agriculture machinery, and cattle ownership, and thus these are the variables that determine the selection equation. The usual control variables are included in the regression equation.

Compared to estimates of program impact on total calories there are noticeable differences in the size of program impact on domestic consumption. While the coefficient of PROCAMPO is approximately the same magnitude, the coefficient of PROGRESA is half as large as the one in the regression for total calories (Table 6). Furthermore, we strongly reject the hypothesis that the impact of the two programs is the same. These results suggest that PROCAMPO increases food security essentially from calories achieved through home production while PROGRESA recipients are not as dependent on home production and obtain their caloric intake from market purchases and home production in equal proportions. The condition of continued agriculture production that PROCAMPO payments require thus appears to make a difference in the way transfer beneficiaries spend their money. The possibility of using PROCAMPO as collateral against which to borrow money makes recipients more likely to invest in home production and hence derive their consumption from this source.

6. Conclusions and Discussion

There are 3 main conclusions of our analysis. First, we do not find systematic evidence that PROGRESA, targeted at women, has a larger overall impact on food security outcomes relative to PROCAMPO, which is targeted at predominantly male farmers. Rather, no significant differences are found for total food consumption and total caloric intake, and for some food categories such as meat and vegetables PROCAMPO seems to have a larger effect relative to PROGRESA. Our results suggest that an intervention aimed at promoting agricultural investment, that is, a cash transfer program linked to a productive

asset (land) can have as large an impact on food security as a proper anti-poverty program.

Second, our results show that there exists some substitution of quantity for quality as cash transfers rise, reflected by the fact that food expenditure elasticities are higher than calorie elasticities. This shift from high calorie to low calorie/better tasting foods is a major policy concern in the development literature. The reported estimates show that most of the observed substitution takes the form of increased food variety, specifically for meat and vegetables. Since poor nutritional status can be caused not only by insufficient intake of calories but also by lack of diet diversity, the observed shift can be considered beneficial. Moreover, there is no significant difference between the impacts of the two programs on diet diversity.

Third, our analysis indicates that the mechanism for achieving food security is significantly different between the programs, a result that is not surprising given the difference in program conditionality. Specifically, we find that PROCAMPO recipients obtain almost all their caloric intake from food consumed out of home production, while PROGRESA recipients are likely to increase food security equally from the market and from home production.

While the overall impact of PROCAMPO and PROGRESA on food security is the same, there are some differences in details regarding specific consumption patterns, and the behavioral responses to the two programs are clearly different with subsequent implications for program design. Recall that the impact of PROCAMPO is measured after 4 years when the medium term spill-over effects from production and investment have been at least partially obtained. The pathway to achieving food security and thus ensuring household welfare for PROCAMPO households is agricultural investment and home production, while in PROGRESA it is through market consumption, and these differing pathways are directly related to program rules and conditionality. The key policy conclusion is that both a production based (in the medium term) and a consumption based (in the short term) poverty intervention can foster food security. The precise choice of program design will thus depend on objectives beyond total food consumption and caloric intake, such as consumption from specific food categories, long term investment in productive capacity, and the degree of access to retail food markets.

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Table 1
Household characteristics

		PROGRESA PROCAMPO			
	ALL	Only	Only	Both	None
Number of households	9841	4353	923	1880	2685
Fraction of total	100	44.23	9.38	19.1	27.28
Transfers per month 1998 (Nov. 1997 pesos) – Means					
PROGRESA	26.3	41.2	0.0	42.4	0.0
PROCAMPO	3.7	0.0	14.6	12.3	0.0
Per capita food consumption	136.3	142.7	125.2	134.8	130.9
Household characteristics (1997) – Means					
Household size	1.69	1.63	1.80	1.79	1.66
Age of household head	42.19	40.94	46.03	44.65	41.16
Head is male (share)	0.92	0.91	0.94	0.94	0.91
Head speaks indigenous language (share)	0.42	0.39	0.50	0.47	0.40
Share of kids 3-4 years old	9.51	10.22	7.23	8.09	10.14
Share of kids 4-9 years old	7.19	7.50	6.28	6.32	7.62
Share of kids 10-13 years old	19.58	19.45	19.72	19.83	19.58
Share of males 11-14 years old	5.59	4.93	6.92	7.01	5.21
Share of females 11-14 years old	5.20	4.70	6.42	5.87	5.14
Share of males 15-19 years old	4.20	3.99	5.17	4.91	3.70
Share of females 15-19 years old	4.50	4.35	4.88	4.91	4.32
Share of males 20-34 years old	9.89	10.99	6.81	7.82	10.61
Share of females 20-34 years old	10.78	11.22	8.98	9.14	11.83
Share of males 35-59 years old	8.31	7.60	10.07	9.65	7.90
Share of females 35-59 years old	8.00	7.50	9.46	9.15	7.52
Share of males 60+ years old	3.58	3.64	4.18	4.01	2.96
Share of females 60+ years old	3.49	3.67	3.76	3.23	3.28
Males with no education (share)	19.27	20.09	17.64	17.68	19.62
Females with no education (share)	21.92	22.25	20.65	20.09	23.13
Literate males (share)	19.86	19.24	21.13	21.64	19.17
Literate females (share)	17.55	17.22	18.1	18.21	17.42
Males with primary education (share)	8.84	8.79	9.43	9.55	8.23
Females with primary education (share)	8.52	8.35	9.06	8.72	8.47
Males with secondary education (share)	1.73	1.78	1.52	1.87	1.62
Females with secondary education (share)	1.53	1.50	1.71	1.52	1.54
Males with higher education (share)	0.22	0.26	0.16	0.18	0.18
Females with higher education (share)	0.15	0.19	0.09	0.08	0.15
Village mean non agricultural wage (Nov. 1997 pesos)	16.15	17.01	16.65	13.59	16.36
Village mean agricultural wage (Nov. 1997 pesos)	2.87	3.03	2.44	1.78	3.5
House has dirt floor (share)	0.74	0.74	0.73	0.72	0.76
House has piped water (share)	0.04	0.04	0.03	0.06	0.03
House has electricity (share)	0.60	0.57	0.65	0.62	0.61
Hectares of irrigated land	0.05	0.04	0.12	0.06	0.03
Hectares of non irrigated land	1.61	1.10	3.26	2.72	1.09
Hectares of pasture land	0.12	0.11	0.17	0.20	0.07
Hectares of forestry land	0.02	0.02	0.03	0.05	0.02
Cows owned	0.61	0.43	1.16	1.00	0.46
Pigs owned	1.03	0.84	1.78	1.25	0.91
Price index	10.39	10.49	9.98	10.44	10.33
Region of residence – Shares					
Sierra Negra-Zongolica-Mazateca	12.34	11.56	14.19	10.90	13.98
Sierra Norte-Otomi Tepehua	18.39	20.45	12.89	12.13	21.32
Sierra Gorda	42.92	41.28	45.61	45.16	43.09
Montana (Guerrero)	10.12	11.3	8.78	12.66	6.90
Huasteca (San Luis Potosi)	1.11	0.80	1.41	1.17	1.45
Tierra Caliente (Michoacan)	12.78	13.21	13.65	11.7	12.52
Altiplano (San Luis Potosi)	2.35	1.40	3.47	6.28	0.75

Table 2
Mean value of food consumption and consumption shares

	ALL		PROGRESA		PROCAMPO		BOTH		NONE	
	Level	Share	Level	Share	Level	Share	Level	Share	Level	Share
Total food	136.3	142.7	125.2	134.8	130.9					
Vegetables	21.5	15.4	22.5	15.6	20.2	14.7	21.7	15.7	20.1	15.0
Grains and cereals	65.9	51.0	68.3	50.4	60.7	52.9	64.2	49.9	65.0	52.2
Meat and animal products	25.6	16.5	27.5	17.0	23.5	15.5	26.6	17.6	22.5	15.1
Other food	22.9	17.1	24.0	17.1	20.3	16.9	22.0	16.8	22.6	17.6

Food consumption measured per person per month in 1997 pesos.

Table 3
Regression estimates for food consumption

	All food	Vegetables	Grains	Meat	Other food
PROGRESA	**0.307**	**0.064**	**0.117**	0.085	0.037
	(3.54)	(4.26)	(2.06)	(3.19)	(3.04)
PROCAMPO	**0.332**	**0.071**	**0.145**	0.117	0.019
	(3.20)	(2.69)	(3.95)	(1.87)	(0.77)
R-squared	0.25	0.11	0.13	0.12	0.12
p-value for PROGRESA=PROCAMPO	0.85	0.81	0.6	0.69	0.48
Instrumental variable estimates					
PROGRESA	0.321	0.065	0.126	**0.087**	**0.039**
	(3.66)	(4.30)	(2.17)	(3.16)	(3.14)
PROCAMPO	0.683	0.142	0.119	**0.652**	**−0.223**
	(1.29)	(1.12)	(0.49)	(2.54)	(1.59)
R-squared	0.25	0.1	0.13	0.1	0.11
p-value for PROGRESA=PROCAMPO	0.5	0.55	0.98	0.03	0.06
p-value for overid test	0.39	0.46	0.3	0.72	0.71
p-value for Hausman exogeneity test	0.47	0.56	0.9	0.02	0.07

Numbers shown are coefficient estimates for peso amount of transfers of PROCAMPO and PROGRESA received by household. Preferred estimates as implied by Hausman test are in bold. T-statistics in parenthesis.

Table 4
Regression estimates for food consumption

	Vegetables	Grains	Meat	Other food
PROGRESA	**0.014**	**−0.031**	0.023	-0.007
	(2.77)	(2.91)	(3.21)	(1.23)
PROCAMPO	**0.008**	**−0.021**	0.04	−0.026
	(0.84)	(1.06)	(2.68)	(3.23)
R-squared	0.07	0.15	0.14	0.13
p-value for PROGRESA=PROCAMPO	0.49	0.65	0.31	0.03
Instrumental variable estimates				
PROGRESA	0.015	−0.03	**0.023**	**−0.008**
	(2.78)	(2.79)	(3.08)	(1.42)
PROCAMPO	0.06	−0.084	**0.259**	**−0.215**
	(1.04)	(0.73)	(2.92)	(2.86)
R-squared	0.06	0.14	0.1	0.08
p-value for PROGRESA=PROCAMPO	0.43	0.64	0.01	0.01
p-value for overid test	0.37	0.46	0.99	0.39
p-value for Hausman exogeneity test	0.6	0.54	0	0

Numbers shown are coefficient estimates for peso amount of transfers of PROCAMPO and PROGRESA received by household. Preferred estimates as implied by Hausman test are in bold. T-statistics in parenthesis.

Table 5
Mean value of caloric availability and calorie share by household type

	ALL		PROGRESA		PROCAMPO		BOTH		NONE	
	Level	Share	Level	Share	Level	Share	Level	Share	Level	Share
Total food	2126.4		2156.2		2095.7		2139.7		2079.4	
Vegetable	42.7	2.1	45.0	2.2	37.8	1.9	45.4	2.3	38.8	2.0
Grains and cereals	1622.6	74.6	1633.7	74.0	1637.5	76.9	1640.0	75.1	1587.1	74.5
Meat and animal products	116.0	5.7	120.2	5.9	108.5	5.4	123.7	6.0	106.5	5.4
Other food	345.2	17.5	357.4	17.9	311.9	15.9	330.6	16.7	347.0	18.1

Calories are measured per person per day.

Table 6
Regression estimates of calorie availability

	All food	Vegetables	Grains	Meat	Other food
PROGRESA	**1.054**	0.114	**0.521**	**0.178**	0.241
	(1.89)	(4.83)	(0.98)	(2.31)	(2.17)
PROCAMPO	**2.802**	0.125	**1.688**	**0.498**	0.491
	(1.62)	(2.38)	(1.25)	(1.70)	(1.50)
R-squared	0.12	0.13	0.07	0.17	0.3
p-value for PROGRESA=PROCAMPO	0.33	0.85	0.42	0.3	0.46
Instrumental Variable Estimates					
PROGRESA	1.064	**0.120**	0.535	0.196	**0.224**
	(1.91)	(4.91)	(1.01)	(2.45)	(2.03)
PROCAMPO	4.033	**0.597**	4.143	2.281	**−3.38**
	(0.63)	(2.31)	(0.70)	(1.72)	(2.23)
R-squared	0.12	0.12	0.07	0.14	0.26
p-value for PROGRESA=PROCAMPO	0.64	0.07	0.54	0.10	0.02
p-value for overid test	0.30	0.72	0.33	0.41	0.55
p-value for Hausman exogeneity test	0.84	0.05	0.66	0.09	0.00

Numbers shown are coefficient estimates for peso amount of transfers of PROCAMPO and PROGRESA received by household. Preferred estimates as implied by Hausman test are in bold. T-statistics in parenthesis.

Table 7
Regression estimates of calorie share

	Vegetables	Grains	Meat	Other food
PROGRESA	0.004	**−0.01**	**0.005**	0.000
	(3.79)	(1.46)	(1.49)	(0.06)
PROCAMPO	0.004	**−0.014**	**0.011**	−0.001
	(2.09)	(1.19)	(1.44)	(0.08)
R-squared	0.09	0.16	0.17	0.12
p-value for PROGRESA=PROCAMPO	0.74	0.78	0.52	0.91
Instrumental Variable Estimates				
PROGRESA	**0.005**	-0.01	0.006	**−0.001**
	(3.80)	(1.40)	(1.66)	(0.12)
PROCAMPO	**0.031**	0.083	0.086	**−0.234**
	(2.33)	(1.08)	(1.47)	(2.61)
R-squared	0.07	0.15	0.15	0.05
p-value for PROGRESA=PROCAMPO	0.05	0.22	0.17	0.01
p-value for overid test	0.86	0.43	0.23	0.16
p-value for Hausman exogeneity test	0.09	0.16	0.14	0.00

Numbers shown are coefficient estimates for peso amount of transfers of PROCAMPO and PROGRESA received by household. Preferred estimates as implied by Hausman test are in bold. T-statistics in parenthesis.

Table 8
Percentage of households not consuming each food type

	ALL	PROGRESA	PROCAMPO	BOTH	NONE
Fruits and vegetables	20	18	27	19	23
Meat and fish	50	48	53	43	58
Dairy products	14	12	19	11	18
Processed food	19	17	23	17	22
Tortillas	10	9	11	9	10
Chicken	60	58	61	54	67
Rice	37	37	38	34	40
Beans	3	3	4	3	3

Table 9
Probit estimates of probability of purchasing food types

	Vegetables	Meat and fish	Dairy	Processed foods
PROGRESA	**0.003**	0.004	**0.003**	**0.003**
	(3.48)	(4.60)	(2.32)	(2.97)
	[.001]	[.001]	**[.001]**	**[.001]**
PROCAMPO	**−0.00**	0.005	0.003	0.002
	(0.17)	(2.31)	(1.54)	(1.11)
	[−.000]	[.002]	**[.001]**	**[.000]**
p-value for PROGRESA=PROCAMPO	0.03	0.52	0.69	0.69

Instrumental Variable Probit Estimates

	Vegetables	Meat and fish	Dairy	Processed foods
PROGRESA	0.003	**0.004**	0.003	0.003
	(5.47)	(6.95)	(4.27)	(4.29)
PROCAMPO	0.006	**0.03**	0.01	0.00
	(0.89)	(4.81)	(1.34)	(0.07)
p-value for PROGRESA=PROCAMPO	0.67	0.00	0.31	0.67
p-value for Smith-Blundell test	0.35	0.00	0.36	0.73

Vegetables exclude tomatoes and onions; Dairy includes milk, eggs and cheese; processed foods include white bread, sweet bread, loaf bread, noodles, crackers, breakfast cereals, cookies, coffee and soft drinks. Numbers shown are coefficient estimates for peso amount of transfers of PROCAMPO and PROGRESA received by household derived from probit regressions. Preferred estimates as regressions. Preferred estimates as implied by Smith-Blundell test are in bold. Z-statistics in parenthesis. Marginal effects in square brackets (only for non instrumental variable estimates).

Table 10
Mean values for diversity analysis

	ALL	PROGRESA	PROCAMPO	BOTH	NONE
Number of foods (max=36)	12.7	12.9	12.3	13.4	12.1
Number of vegetables (max=10)	3.7	3.8	3.5	4.0	3.5
Number of grains and cereals (max=11)	4.3	4.4	4.2	4.5	4.2
Number of animal products (max=9)	2.0	2.0	1.9	2.2	1.8
Number of other foods (max=6)	2.7	2.7	2.7	2.7	2.6
Number of processed foods (max=8)	1.6	1.6	1.5	1.7	1.4
Simpson index	0.7	0.7	0.6	0.6	0.6
Shannon index	1.5	1.5	1.4	1.5	1.5
ROD index	0.9	0.9	0.8	0.9	0.9

See text for definition of indexes.

Table 11
Regression estimates for diet diversity

	No. of foods	Simpson index	Shannon index	ROD index
PROGRESA	**0.012**	**0.02**	**0.079**	**0.014**
	(4.37)	(2.43)	(3.34)	(2.39)
PROCAMPO	**0.017**	**0.022**	**0.112**	**0.009**
	(4.04)	(1.89)	(3.53)	(1.07)
R-squared	0.19	0.19	0.21	0.07
p-value for PROGRESA=PROCAMPO	0.27	0.89	0.42	0.63
Instrumental Variable Estimates				
PROGRESA	0.012	0.02	0.08	0.014
	(4.40)	(2.45)	(3.37)	(2.43)
PROCAMPO	0.06	0.036	0.343	0.11
	(1.81)	(0.37)	(1.17)	(1.62)
R-squared	0.18	0.19	0.21	0.05
p-value for PROGRESA=PROCAMPO	0.15	0.87	0.37	0.16
p-value for overid test	0.76	0.53	0.77	0.58
p-value for Hausman exogeneity test	0.17	0.88	0.39	0.1

Numbers shown are coefficient estimates for peso amount of transfers of PROCAMPO and PROGRESA received by household. Preferred estimates as implied by Hausman test are in bold. T-statistics in parenthesis. See text for definition of indexes.

Table 12
Caloric availability from home production

PERCENTAGE	ALL	PROGRESA	PROCAMPO	BOTH	NONE
Total food	30	27	42	40	25
Vegetables	15	14	16	16	15
Grains and cereals	39	35	52	51	31
Meat and animal products	10	10	12	12	9
Other food	0	0	0	0	0

Shares are out of total calories.

Table 13
Regression estimates of calories from home production

	Level	Share
PROGRESA	0.552	−0.022
	(1.78)	(1.55)
PROCAMPO	2.859	0.008
	(3.75)	(0.21)
p-value for PROGRESA=PROCAMPO	0	0.44
Rho	0.249	−0.945
	(5.25)	(77.65)
p-value for likelihood ratio test rho=0	0.00	0.00

Numbers shown are coefficient estimates for peso amount of transfers of PROCAMPO and PROGRESA received by household derived from selectivity corrected maximum likelihood. Z-statistics in parenthesis.