

The Impacts of the CCT and Rising Food Prices on the Consumption of Rural Poor in Mexico

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Abstract:

More than 15 years have passed since Mexico's Conditional Cash Transfer (CCT) Program was introduced as a new targeted poverty reduction strategy. CCTs have two main objectives to alleviate 'present poverty' through cash transfers, and to reduce 'future poverty' by promoting investment in human capital. This paper will emphasize the former aspect by discussing the effects of the CCT program on the consumption of the rural poor in Mexico. In this respect, the causality between poverty degradation and the food price increases between 2003 and 2007 will be examined using household panel data. The empirical results show that poverty, measured by food consumption, worsened significantly. Moreover, the cash transfer of CCT served as a partial buffer, but could not protect the poorest of the poor completely from price shocks.

1. Introduction

It has been more than 15 years since Mexico's Conditional Cash Transfer (CCT) Program: Education, Health and Nutrition Program (*Programa de Educación, Salud e Alimentación: PROGRESA*) was started in 1997 to replace all existing poverty programs. Targeting its benefits directly to the population in extreme poverty in rural areas, the program was intended (1) to alleviate 'current' poverty through monetary and in-kind benefits, and (2) to reduce 'future' levels of poverty by encouraging investment in education, health and nutrition (Skoufias 2007). The program, which was renamed "Oportunidades" after the change of government in 2000, has finally achieved including over 5 million families in all Mexican states (Wood et al. 2009). In this paper, the

program will be designated as PROGRESA-Oportunidades.

In this paper, the discussion will center upon how much PROGRESA-Oportunidades was able to reduce ‘current’ poverty, measured by food consumption, through cash transfers. Levy (2006), the key person of designing and introducing PROGRESA-Oportunidades under the Zedillo administration, regards the redistribution of income to families in extreme poverty by increasing their certainty of having a minimum level of consumption as one of the major objectives of PROGRESA-Oportunidades, together with the improvement of child schooling and poor families’ health and nutrition status.

Greater attention, however, has been devoted to aspects of reducing ‘future’ poverty by intervening children’s education and health and nutrition. Moreover, with respect to consumption aspects of PROGRESA-Oportunidades, almost all studies used data before 2003 and have confirmed poverty improvement. Few studies have examined the issue of the poverty trend and the effects of PROGRESA-Oportunidades after 2003.

The Mexican economy, in fact, enjoyed stability and positive growth during the 7 years from 2001 until the economic crisis caused by the Lehman shock in 2008. Poverty indices were also in a decreasing trend on a national level at least until 2006¹ despite the gradual increase of food prices. Did the poorest of the poor in marginal rural areas covered by PROGRESA-Oportunidades enjoy the same economic and social benefits as the remainder of the nation? The answer is no. The analyses of poverty trends of rural areas eligible for PROGRESA-Oportunidades during 2003–2007 in this paper reveal the poverty degradation that occurred, as measured by food consumption, possibly because of food price increases. In addition, the regression results showed that the CCT cash transfers served only as a partial buffer against the drop of the poor households’ consumption level. This would imply that CCT alone would be insufficient to help poor people escape completely from poverty trap once they face any kinds of unexpected shocks such as sudden food price increases.

In the next section, characteristics of PROGRESA-Oportunidades and its panel data created for the external evaluations will be explained briefly. Section 3 presents a literature review focusing on consumption aspects of the CCT. In Section 4, the poverty trend of marginal rural areas during 2003–2007 will be described. Subsequently, the section specifically examines the impacts of food price increases on rural poverty and presents the degree to which the CCT program contributed as a buffer to price shocks. Then an empirical analysis using panel data will be conducted in Section 5 to confirm the impact of food price increases and the effects of CCT on the poverty degradation during 2003–2007. Section 6 concludes.

2. Characteristics of PROGRESA-Oportunidades and its Panel Data

As described above, CCT programs were generally undertaken with two clear objectives. First, they provide poor households with a minimum consumption floor (to reduce “current” poverty). Second, in making transfers conditional, they encourage the accumulation of human capital to break a vicious cycle whereby poverty is transmitted across generations (to reduce “future” poverty) (Fiszbein and Schady 2009). With respect to Mexican PROGRESA-Oportunidades, the education component is designed to increase school enrollment among youth in Mexico’s poor rural communities by making educational grants available to pupil’s mothers, with the requirement that greater than 85 percent attendance be achieved. In the area of health and nutrition, PROGRESA-Oportunidades includes distribution of nutritional supplements, education related to hygiene and nutrition, and monetary transfers for the purchase of food. Receipt of monetary transfers and nutritional supplements is tied to mandatory visits to public clinics for health care². The average monthly payment (received every two months) by a beneficiary family amounts to 20 percent of the value of monthly consumption expenditures prior to the initiation of the program. One additional requirement of the PROGRESA-Oportunidades program is that households benefiting from PROGRESA-Oportunidades were obligated to stop receiving benefits from other programs (Skoufias 2005).

The series of household panel data for the evaluation of PROGRESA-Oportunidades is called *Encuestas de Evaluación de los Hogares (ENCEL)*, which is designed and conducted periodically by the Social Development Secretary (Secretaría de Desarrollo Social: SEDESOL) assisted by the International Food Policy Research Institute (IFPRI) for the purpose of the external evaluation of the program. A unique characteristic of the ENCEL is that the randomized experiment was implemented at the beginning of the program to evaluate the effects of the program accurately. The full sample of ENCEL consists of repeated observations collected for 24,000 households from 506 localities (villages) in the 7 states of Guerrero, Hidalgo, Michoacán, Puebla, Querétaro, San Luis Potosí and Veracruz. Of those 506 localities, 320 localities were assigned to the treatment group (denominated as “Treatment 1998” herein), and 186 localities were assigned as controls (denominated as “Treatment 2000” herein). The eligible households of the control localities couldn’t receive benefits of PROGRESA-Oportunidades until 2000 (Skoufias 2007).

An additional comparison group of 151 localities not yet incorporated into the program was selected as a new control group using propensity score matching (PSM) for

the seventh round of the survey in 2003 (denominated as “Control 2003” herein) (Todd 2004). They became entitled to receive benefits by 2004. In total, eight rounds of surveys were conducted in the most marginal rural areas by 2007, which enables researchers to make use of a long period of micro-panel data.

As described in this paper, we use rural samples of the two most recent rounds available: the years 2003 and 2007.

3. Literature Review: Impacts of CCT and Food Price Increases on Poverty in Mexico

The literature that specifically describes the short-term purpose of alleviating ‘present’ poverty—in other word, consumption—will be surveyed in this section. First, Hoddinott and Skoufias (2004) and Hoddinott and Wiesmann (2008) studied whether PROGRESA-Oportunidades could have improved the diet of the rural poor in Mexico or not using the first three rounds of ENCEL panel data in October 1998 (ENCEL98O), May-June 1999 (ENCEL99M) and November 1999 (ENCEL99N). Both studies revealed that the program benefits increased caloric acquisition compared to their counterparts in the control villages. They also showed that the impact of PROGRESA-Oportunidades was greater on the improvement of dietary quality: the acquisition of calories from fruits, vegetables, and meats.

Skoufias and di Maro (2008) and Fiszbein and Schady (2009) analyzed the impact of PROGRESA-Oportunidades on poverty reduction using ENCEL98O, ENCEL99M and ENCEL99N. Both analyses showed a substantial reduction in poverty as measured by FGT indices for those participating in the program. Skoufias and di Maro (2008) reported that the poverty reduction effects were stronger for the poverty gap and severity of poverty measures³.

Skoufias (2007) conducted an empirical analysis of the risk insurance model using three rounds of ENCEL panel data of 1998–1999. The effect of PROGRESA-Oportunidades on the improvement of the pre-existing risk sharing within villages was not statistically significant, but the analysis results revealed that receiving benefits of PROGRESA-Oportunidades enables households to insulate their consumption from idiosyncratic income shocks better than their counterparts. In addition, Angelucci and De Giorgi (2006; 2009) confirmed the indirect effect, or “spillover effect” of PROGRESA-Oportunidades cash transfers to increase the consumption of ineligible households living in the same treatment village.

Gertler et al. (2012) discussed the investment effect on welfare using ENCEL data for 1998–2003 and results of a baseline survey (ENCASEH) of 1997. Their estimates show that households consume about three-quarters of the transfer and invest the rest. Some studies, such as Angelucci and Attanasio (2009) and Krishnakumar and Chávez Juárez (2010), show that PROGRESA-Oportunidades has reduced poverty in urban areas.

All literature on consumption by 2003 has revealed a significant positive effect of PROGRESA-Oportunidades on poverty. It is notable that the data used in the literature are mostly those for 1998–1999, when the ideal randomized experiment to compare the program effects had been conducted. Some of the literature specifically describes a longer period extending to 2003, but only two reports (Arroyo et al. 2008; Attanasio et al. 2009) use data extending to 2007, the latest data available today.

Arroyo et al. (2008) analyzed the long-term effects of PROGRESA-Oportunidades on the consumption of the benefited households as well as on their decision-making for the investment and saving by using ENCEL 2007. They concluded, with respect to the consumption, that households with longer exposure to the program tend to have greater per-capita consumption level than those with shorter exposure. However, they use only one year data for 2007 and didn't take into account the price effects that stated to affect the poor households in this period.

Attanasio et al. (2009) simulated the welfare consequences of the recent increases in food prices in Mexico and Colombia using CCT panel data. They showed that CCT programs provide better means of alleviating the problem of increasing staple prices than other indirect policies, computing the effects of 50 peso transfer and 5 percent price subsidy. This is the only analysis of Mexican food price increases and poverty that has used ENCEL data to date. They, however, completely dropped the “Control 2003” samples. Moreover, it would be necessary to examine the validity of their assumption by other estimation methods.

Several other studies, Valero-Gil and Valero (2008) and Wood et al. (2009) have examined the impacts of the food price increases on poverty in Mexico using the National Income and Expenditure Survey of Households (ENIGH) for 2006. Both of them found a negative impact of the price change on the welfare of poor households. These studies also refer to CCT, but only in a complementary manner⁴.

As described above, few studies have examined the longer-term effects of PROGRESA-Oportunidades despite the availability of the updated data after 2000. More

studies must particularly address the recent effects of the CCT on consumption and poverty by using data for 2007, which can also account for the important macro shock caused by commodity price increases.

4. Poverty Trend in Rural Mexico and Food Price Increases: 2003–2007

4-1. Poverty Trend in Rural Mexico

In this section, we examine the poverty trend of the most marginal areas of rural Mexico during 2003–2007 using household samples of the ENCEL data described above. The FGT poverty indices (Foster et al. 1984)—the most popular indices in measuring poverty—are used. The FGT indices are defined as

$$P_{\alpha} = \frac{1}{n} \sum_{i=1}^q \left(1 - \frac{c_{it}}{z}\right)^{\alpha}, \quad (1)$$

where q represents the number of individuals i whose consumption at time t , denoted by c_{it} , is below a certain level of poverty line z . Also, n represents the total population. When $\alpha = 0, 1$, or 2 , P_0, P_1 , or P_2 respectively represents “Poverty head count ratio”, “Poverty gap ratio” and “Squared poverty gap ratio”.

In this paper, per-capita weekly food consumption of each household, which is the sum of monetary expenditures and self-consumption, will be used to estimate the FGT indices⁵. The official rural food basket (*canasta básica alimentaria rural*) published by National Council for the Evaluation of Social Development Policy (*Consejo Nacional de Evaluación de la Política de Desarrollo Social: CONEVAL*) is used as the poverty line. Both the per-capita food consumption and the poverty line are deflated by the state-level food CPI⁶.

Table 1 presents the changes in the three types of FGT indices during 2003–2007. Indices were calculated using the overall sample as well as using three sub-samples: the original treatment groups (villages) in which the eligible households started receiving benefits in 1998, denominated as “Treatment 1998”, the original control villages receiving benefits since 2000 (Treatment 2000), and the new control villages, which were integrated in the ENCEL in 2003 and which started receiving benefits by 2004 (Control 2003).

The striking result of Table 1 presents that poverty worsened (rose) in all three different types of indices as well as in all three sub-samples with different periods of program exposure. The poverty head count ratio increased 2 percentage points in overall (from 94 percent to 96 percent), in “Treatment 2000” (from 95 percent to 97 percent),

and in “Control 2003” (from 91 percent to 93 percent), and 3 percentage points in “Treatment 1998” (from 94 percent to 97 percent)⁷. The poverty gap ratio, which indicates the ‘depth’ of poverty, also worsened by 7 percentage points (from 0.55 to 0.62) in overall and by 5–8 percentage points in the sub-samples. The squared poverty gap ratio, which represents the ‘severity’ of poverty, rose markedly. Aggravation of the poverty gap ratio and the squared poverty gap ratio confirms that the distribution among the poor also worsened, which means that the poorest of the poor became much poorer than the rest.

Table 1. Changes in FGT Indices (Per-Capita Food Consumption), 2003–2007

Poverty Indices	Overall Sample		Treatment 1998		Treatment 2000		Control 2003	
	2003	2007	2003	2007	2003	2007	2003	2007
Headcount ratio	0.94	0.96	0.94	0.97	0.95	0.97	0.91	0.93
Poverty gap ratio	0.55	0.62	0.56	0.64	0.57	0.64	0.49	0.54
Squared poverty gap ratio	0.37	0.44	0.38	0.46	0.38	0.46	0.31	0.36
Number of obs	18,924	18,924	9,012	9,012	6,285	6,285	3,627	3,627

Source: Author’s calculation based on ENCEL2003 and 2007.

The level of poverty indices of “Control 2003” is modest compared to the other two treatment groups in 2003 and 2007, which suggests that the profile of the “Control 2003” should be different (less poor) even though this group was added to serve as a new ‘control’ for the original samples. Furthermore, the magnitude of changes in FGT indices is less in the poverty gap and squared poverty gap ratios in the case of “Control 2003”, which confirms again the hypothesis that the most vulnerable households, which are most easily affected by unexpected shocks, should be the poorest of the poor.

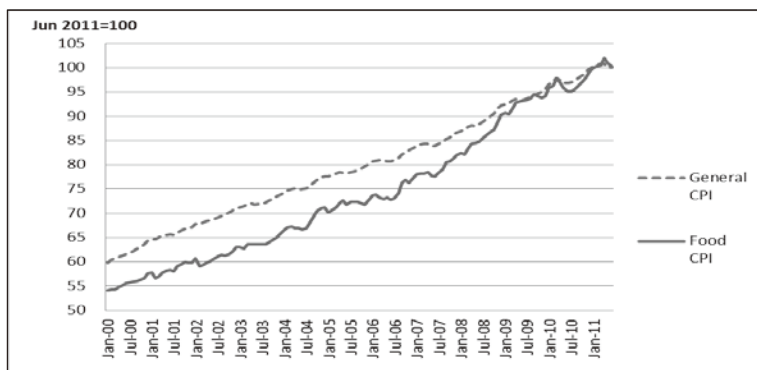
4-2. Food Price Increases in Mexico

A continuous rise in food prices has been observed during 2003–2007 in Mexico. Figure 1 presents the trends of general and food CPIs at the national level. It is apparent that the food CPI growth has been larger than the general CPI. In fact, the proportion of the food CPI relative to the general CPI rises from 0.88 as of January 2003 to 0.94 as of December 2007.

This phenomenon presumably occurred in correspondence to the food price increases in the international market, especially those of soy beans and cereals such as corn, wheat, and rice. Figure 2 shows the monthly international food and cereal price indices. It is clear that the international food price increase has been caused by the price rise in cereals. The main reason for this unusual price increase is the high demand for biofuels (Valero-Gil and Valero 2008). Since Mexico has fully liberalized the import of maize, its

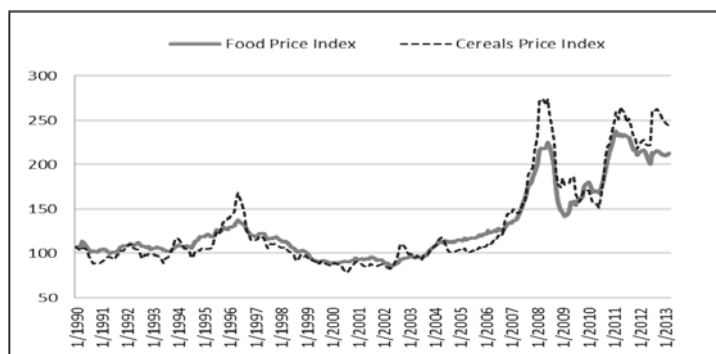
principal grain, its domestic price is determined fundamentally by the same mechanism as that of the United States (Tani 2012). In fact, Mexico imports one-third of its domestic consumption (Tani 2012)⁸, almost all of it from the United States.

Figure 1. CPI Trends in Mexico (Monthly), 2000-2011



Source: Author's elaboration based on the data from Banco de México

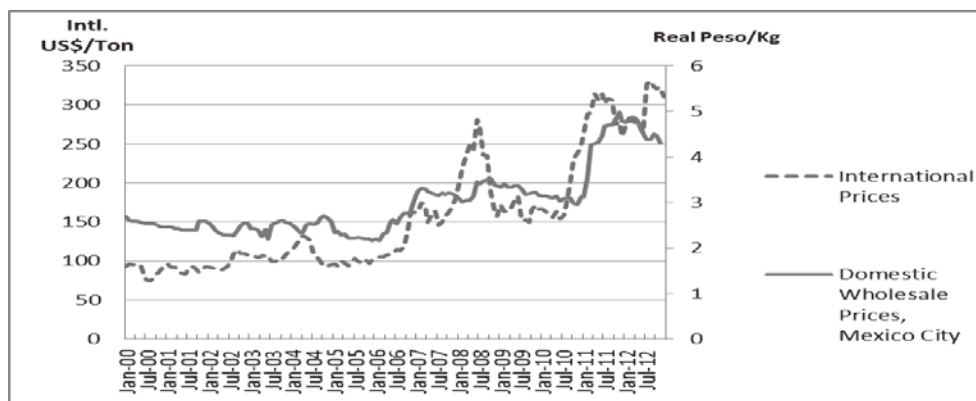
Figure 2. Changes in Monthly International Food/Cereals Price Index, 1990–2013



Source: Author's Elaboration based on FAO Food Price Index

Figure 3 shows both the domestic wholesale price⁹ and the international price of maize. It is noteworthy that the domestic price follows the international price trend. The wholesale price of maize in Mexico City rose by 1.3 times during 2003–2007 from 2.46 pesos per kilo to 3.21 pesos (annual average) while its international price increased by more than 1.5 times during the same period¹⁰.

Figure 3. Mexican Domestic and International Prices: Maize, 2000–2012



Source: Author's elaboration based on FAO GIEWS and FAO International.

The impacts of food price increases on the rural poverty in Mexico and the CCT effects will be discussed in detail in the next sub-sections.

4-3. Impacts of Food Price Increases on Rural Poverty and the Effects of CCT

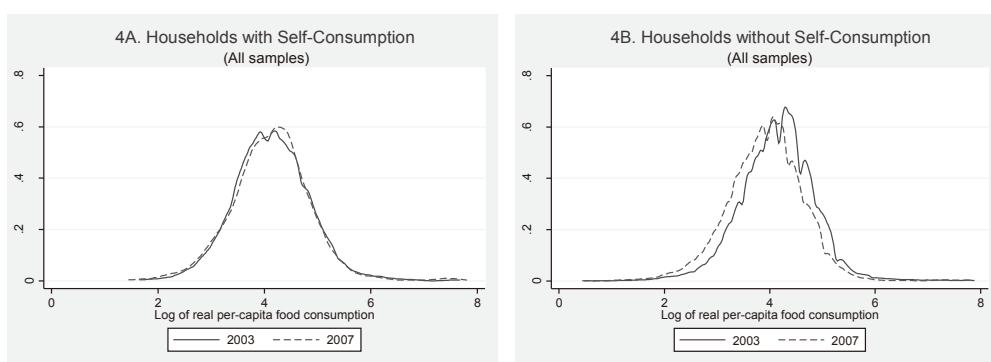
4-3-1. Impacts of Food Price Increases on Rural Poverty

Figure 4 shows the kernel densities of per-capita real food consumption in 2003 and 2007. To ascertain the different impacts of the food price increases in this period, the sample is divided into two groups: households with self-consumption in 2007 (Fig. 4A) and those without self-consumption (Fig. 4B). The reasons why having self-consumption or not is used are the followings: (i) farmers are widely known, if they rationally respond to the market signals, to increase their agricultural production when the food price rises; (ii) poor farmers, who are the principal target of PROGRESA-Oportunidades, are mostly engaged in maize cultivation for their daily consumption of tortillas^{1 1}; and (iii) the estimates of the per-capita consumption used for this study have taken into account the amount of self-consumption as a part of each household's food consumption. Consequently, having self-consumption or not is supposed to directly reflect the influence of food price increases, especially that of maize. The self-consumption dummy will be utilized hereafter as a proxy of the food price increase to measure its impacts.

The figure shows that the overall food consumption level of households without self-consumption decreased in 2007 compared to that of 2003 (the distribution shifts to the left in Fig. 4B), whereas households having self-consumption in 2007 maintain their food consumption level despite the food price increases in Fig. 4A. When comparing the

averages of real per-capita food consumption, households having self-consumption in 2007 increased their weekly per-capita food consumption by 7.7 percent from 87.5 pesos (on average) in 2003 to 94.2 pesos (on average) in 2007. The weekly per-capita consumption of those without self-consumption in 2007 reduced by 25.5 percent from 95.7 pesos (on average) to 71.3 pesos (on average).

Figure 4. Kernel Density of per-capita Food Consumption



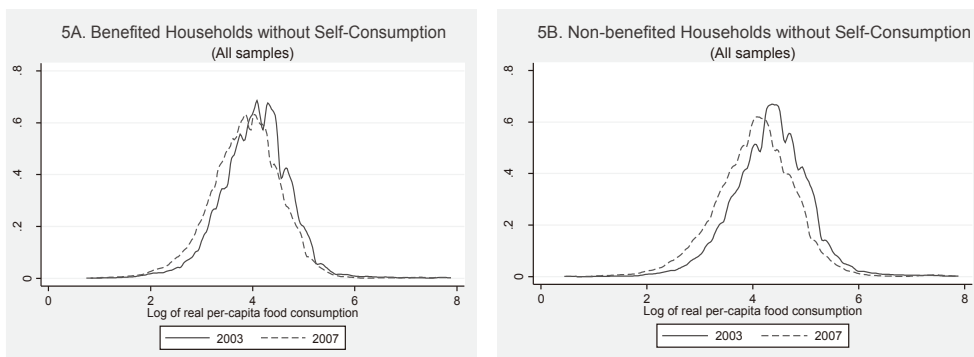
Source: Author's elaboration based on ENCEL 2003, 2007

In the next subsection, the discussion is focused on whether the cash transfers by PROGRESA-Oportunidades can prevent households from falling into a poorer situation by lowering their consumption level.

4-3-2. 'Buffer' Effects of the CCT on Poverty Degradation

In Figure 5, only households without self-consumption in 2007, who are supposed to have been affected by price increases, are selected to divide them into two groups: those receiving cash transfers from PROGRESA-Oportunidades in 2007 (Fig. 5A) and those without benefits (Fig. 5B). As the figure shows, the shift of distribution to the left is smaller for the benefitted households, which means that the consumption level of benefitted households falls less. When comparing the average weekly per-capita consumption of each group, that of benefitted households fell by 11.3 percent from 84.0 pesos (on average) in 2003 to 66.3 pesos (on average) in 2007. In contrast, the average consumption of households not receiving benefits fell by as many as 32.2 percent from 121.8 pesos in 2003 to 82.4 pesos in 2007.

Figure 5. Kernel Density of per-capita Food Consumption



Source: Author's elaboration based on ENCEL 2003, 2007

In sum, one can infer that cash transfers by PROGRESA-Oportunidades had partial (not complete) consumption smoothing effects when facing the unexpected food price increases. Empirical analyses will be conducted in the next sub-section to confirm statistically the robustness of this inference.

5. Empirical Analysis

5-1. Methods

The model for the panel to be estimated is the following:

$$c_{it} = \alpha + \beta Year_{07} + \gamma Benefit_{07} + \delta Self_{07} + v_i + \epsilon_{it},$$

$$i = 1, \dots, N, t = 1, \dots, T, \epsilon_{it} \sim iid(0, \sigma^2) \quad (2)$$

$$c_{it} = \alpha + \beta_1 Year_{07} + \beta_2 D_{2000} \cdot Year_{07} + \beta_3 D_{2003} \cdot Year_{07}$$

$$+ \gamma Benefit_{07} + \delta Self_{07} + v_i + \epsilon_{it}, \quad (2)'$$

$$c_{it} = \alpha + \beta Year_{07} + \gamma Benefit_{07} + \delta Self_{07}$$

$$+ \theta D_{2003} (\beta Year_{07} + \gamma Benefit_{07} + \delta Self_{07}) + v_i + \epsilon_{it}, \quad (2)''$$

where c_{it} represents real per-capita food consumption of household i in time t . The remainder of the independent variables are all dummies that take 1 if $t = 2$ ($Year_{07}$), if household i receives a cash transfer from PROGRESA-Oportunidades in 2007 ($Benefit_{07}$) and if household i has self-consumption in 2007 ($Self_{07}$). v_i is a time-invariant idiosyncratic (household specific) error term and ϵ_{it} , the remainder disturbance of mean zero and independent and identically distributed (i.i.d.). In addition, interaction terms of different treatment/control groups ("Treatment 2000" and "Control 2003"), D , with $Year_{07}$, $Benefit_{07}$ or $Self_{07}$ are used to control the group-specific

effects that must be attributed to the difference of the years receiving benefits and their profiles as indicated in equations (2)' and (2)'' .

The parameters of this model can provide 'average' effects of the price shock and of the CCT to the households' consumption level. The price shock is explained by $Year_{07}$ dummy as a macro shock to all households that happened during 2003-2007, and by $Self_{07}$ dummy for the reasons discussed above. Furthermore, the merit of this model is that we can control the time-invariant idiosyncratic characteristics of the households to extract 'common' effects of food price increases and of CCT cash transfers.

5-2. Results

Table 2 presents the summary statistics of the variables to be used in the analysis. Only 8 percent of the households practice self-consumption. 69 percent of the sample received cash transfer of PROGRESA-Oportunidades, which is consistent with the other reports of the literature. "Treatment 1998", "Treatment 2000" and "Control 2003" respectively account for 47 percent, 33 percent and 19 percent^{1 2}.

Table 2. Summary Statistics

Variable	Mean	Std. Dev.	Min	Max	Observations
<i>log of weekly real per-capita food consumption</i>	4.04	0.74	-2.08	9.68	N = 37515
<i>year dummy (2007=1)</i>	0.50	0.50	0	1	N = 37530
<i>self-consumption in 2007 (dummy)</i>	0.08	0.27	0	1	N = 37530
<i>receiving cash transfer from PROGRESA in 2007 (dummy)</i>	0.69	0.43	0	1	N = 37530
<i>Treatment 1998 (dummy)</i>	0.47	0.50	0	1	N = 37530
<i>Treatment 2000 (dummy)</i>	0.33	0.47	0	1	N = 37530
<i>Control 2003 (dummy)</i>	0.19	0.39	0	1	N = 37530

Source: ENCEL 2003, 2007

Table 3 presents the regression results. Model 1 shows that the consumption dropped by about 21 percent on average in 2007 compared to the 2003 level. Receiving benefits in 2007 increases consumption level by about 10–11 percent on average (Models 2, 4, 6, 7), whereas having self-consumption in 2007 increases consumption by about 22–23 percent (Models 3, 4, 6, 7). When controlling $Benefit_{07}$, the magnitude of coefficients of $Year_{07}$ rises by about 10 percentage points, which means that the consumption level would drop by about 30 percent on average if a household received no benefits nor practiced self-consumption in 2007 (Models 4, 6, 7).

With respect to the group dummies, only "Control 2003" interacted with $Year_{07}$ is statistically significant (Models 5 and 6), which implies that "Control 2003" has a different profile from the other two groups as discussed in the preceding section. It is

particularly interesting, however, that neither of the interaction terms of the “Control 2003” dummy and *Benefit*₀₇ or *Self*₀₇ become statistically significant (Model 7), which implies that the effects of cash transfers or of self-consumption are independent of the factors inherent in any of the treatment/control groups.

Table 3. Regression Results of Panel data

Dependent Variable: Log of weekly real per-capita food consumption										
	Model 1		Model 2		Model 3		Model 4	Model 5	Model 6	Model 7
	Fixed	Random ^a	Fixed	Fixed	Random ^a	Fixed	Fixed	Fixed	Fixed	
<i>year 2007</i>	-0.209	-0.209	-0.280	-0.227	-0.227	-0.299	-0.223	-0.326	-0.325	
<i>year 2007 * Treatment 2000</i>	(-33.60)***	(-33.60)***	(-25.11)***	(-35.05)***	(-35.44)***	(-26.44)***	(-24.73)***	(-24.34)***	(-24.53)***	
<i>year 2007 * Control 2003</i>							0.081	0.102	0.094	
							(4.84)***	(6.06)***	(3.71)***	
<i>benefit in 2007</i>			0.103			0.104		0.116	0.112	
			(7.65)***			(7.72)***		(8.58)***	(7.28)***	
<i>self-consumption in 2007</i>				0.223	0.216	0.224		0.225	0.226	
				(9.69)***	(11.53)***	(9.75)***		(9.83)***	(8.93)***	
<i>benefit 2007 * Control 2003</i>									0.017	
									(0.53)	
<i>self-consumption 2007 * Control 2003</i>									-0.003	
									(-0.04)	
<i>Constant</i>	4.145	4.145	4.145	4.145	4.145	4.145	4.145	4.145	4.145	
	(941.21)***	(770.13)***	(942.66)***	(943.54)***	(771.30)***	(945.02)***	(941.87)***	(946.06)***	(946.04)***	
Number of obs	37515	37515	37515	37515	37515	37515	37515	37515	37515	
R-sq: within	0.0568	0.0568	0.0598	0.0615	0.0615	0.0645	0.0582	0.0667	0.0667	
between	0.0000	0.0000	0.0327	0.0021	0.0021	0.0061	0.0224	0.0001	0.0001	
overall	0.0197	0.0197	0.0118	0.0227	0.0227	0.0146	0.0255	0.0195	0.0194	
F test	F=2.05	-	F=1.98	F=2.06	-	F=1.99	F=2.02	F=1.97	F=1.98	
Prob>F	0.000	-	0.000	0.000	-	0.000	0.000	0.000	0.000	
Breusch and Pagan test	-	chi2(1)=2053.41	-	-	chi2(1)=2069.57	-	-	-	-	
Prob>chi2	-	0.0000	-	-	0.0000	-	-	-	-	
Hausman test	chi2(1)=0.58		chi2(2)=661.84		chi2(2)=0.76	chi2(3)=664.48	chi2(3)=209.57	chi2(5)=805.54	chi2(6)=823.39	
Prob>chi2	0.4453		0.0000		0.6828	0.0000	0.0000	0.0000	0.0000	

Note: t statistics (for fixed effects model) or z statistics (for random effects model) are in parentheses. ***, **, * are significant at 1, 5, and 10 percent.

a: Random effects model is also shown when Hausman specification test adopts the model.

Source: ENCEL 2003, 2007.

Table 4 presents regression results of household samples without self-consumption to illustrate the ‘buffer’ effects of cash transfers of PROGRESA-Oportunidades more accurately. Model 1, with only the year dummy, shows that the households without self-consumption in 2007 decreased their consumption level by about 23 percent on average. The decrease, however, worsens to 30–32 percent when the *Benefit*₀₇ dummy is included (Models 2 and 4), which implies that the consumption level will drop by more than 30 percent if the households have neither self-consumption nor PROGRESA-Oportunidades benefits. Cash transfers of PROGRESA-Oportunidades compensate the drop of eligible households’ food consumption by about 11 percentage points on average.

Table 4. Regression Results of Panel data
(Households without self-consumption in 2007)

Dependent Variable: Log of weekly real per-capita food consumption					
	Model 1		Model 2	Model 3	Model 4
	Fixed	Random ^a	Fixed	Fixed	Fixed
<i>year 2007</i>	-0.227	-0.227	-0.301	-0.245	-0.330
<i>year 2007 *</i>	(-35.15)***	(-35.14)***	(-25.99)***	(-26.07)***	(-18.82)***
<i>Treatment 2000</i>				0.003	0.007
<i>year 2007 *</i>				(0.18)	(0.25)
<i>Control 2003</i>				0.087	0.098
<i>benefit in 2007</i>			0.107	(4.99)***	(3.49)***
<i>benefit 2007 *</i>			(7.69)***		0.120
<i>Treatment 2000</i>					(5.76)***
<i>benefit 2007 *</i>					-0.009
<i>Control 2003</i>					(-0.26)
<i>Constant</i>	4.146	4.146	4.146	4.146	4.146
	(907.97)***	(740.50)***	(909.50)***	(908.65)***	(910.48)***
Number of obs	34527	34527	34527	34527	34527
R-sq: within	0.0669	0.0669	0.0700	0.0684	0.0723
between	0.0000	0.0000	0.0321	0.0223	0.003
overall	0.0232	0.0232	0.0148	0.0292	0.020
F test	F=2.08	-	F=2.00	F=2.05	F=1.99
Prob>F	0.000	-	0.000	0.000	0.000
Breusch and Pagan test	-	chi2(1)=1939.25	-	-	-
Prob>chi2	-	0.000	-	-	-
Hausman test		chi2(1)=0.83	chi2(2)=608.94	chi2(3)=190.93	chi2(6)=756.80
Prob>chi2		0.3632	0.0000	0.0000	0.0000

Note: t statistics (for fixed effects model) or z statistics (for random effects model) are in parentheses.

***, **, * are significant at 1, 5, and 10 percent.

a: Random effects model is also shown when Hausman specification test adopts the model.

Source: ENCEL 2003, 2007.

The interaction terms of treatment/control group dummies with $Year_{07}$ or $Benefit_{07}$ are included in models 3 and 4, respectively, to control the length of exposure to the program and the different profiles of respective groups. As in Table 3, only the interaction term of $Year_{07}$ and “Control 2003” is positive and significant, which implies that no significant difference of length or profiles exists between “Treatment 1998” and “Treatment 2000”, but the “Control 2003” households’ decrease in consumption is slightly smaller than the original two groups because of their different profiles (not so poor as their counterparts). The statistical insignificance of the interaction terms of treatment/control groups dummies and $Benefit_{07}$ for both “Treatment 2000” and “Control 2003” indicates that the ‘buffer’ effects of PROGRESA-Oportunidades against the food price increases is the same among all groups (Model 4).

6. Concluding Remarks

As described in this paper, the discussion emphasized the impacts of the food price increases on the poverty degradation in rural Mexico prevailing during 2003–2007, particularly addressing the ‘buffer’ effects of CCT against the macro shock. Results present strong evidence that the substantial drop of food consumption level during 2003–2007 should be attributed to the domestic food price increases caused by international price changes (especially for maize). In addition, the empirical analysis confirmed the positive effects of PROGRESA-Oportunidades (especially through cash transfers) but the effects were insufficient to compensate the entire loss of consumption, compared to the roles played by self-consumption.

Finally, the empirical results of this study implies that CCT should not be overvalued for the fact that the program cannot fully cope with the poverty degradation especially in case of external shocks. Kurosaki (2009) argues that poor households are vulnerable to risk in the sense that they fall into severer poverty trap once they encounter any unexpected external shocks, which might cancel out the longer-term effects of the program that have been promoted by the investment in education and health. Additional policy measures, including flexible in-kind benefits^{1 3}, should be strongly required to compensate these plausible losses whenever an unexpected event happens.

The shortcoming of this paper, however, is that variables such as income and price, which should be other important factors in determining the consumption level, were not considered directly in the regression models because of the data complexity. This remains for a future study. Furthermore, it is noteworthy that this analysis cannot incorporate consideration of the recent economic crisis caused by the Lehman shock because of limited data availability. In addition, the steep rise of food prices had just begun in this period. Peaks were found in 2008 and in 2011. It is likely that the poverty circumstances of these households would have worsened even more severely after 2007. We must continue to observe, using new data, the poverty trends and the roles of PROGRESA-Oportunidades amid the severe economic situation.

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ENDNOTES

¹ Data from World Development Indicators online and CONEVAL (<http://www.coneval.gob.mx>). However, it is difficult to determine exactly when the poverty trend reversed due to the absence of national household survey data for 2007.

² This aspect of the program emphasizes targeting benefits to children under five, and pregnant and lactating women (Skoufias 2005).

³ Skoufias and di Maro (2008) also studied the relation between PROGRESA-Oportunidades and adult work incentives, concluding that no evidence exists to show that the program affected adult participation in the labour market and overall adult leisure time.

⁴ Wood et al. (2009) only use the information to distinguish poor from non-poor. Valero-Gil and Valero (2008), in contrast, consider the buffer effect of PROGRESA-Oportunidades to the price shocks with another public policy for prices. Still their argument addresses neither the consumption of each household nor that of rural poor, but only focuses on the aggregated poverty ratio.

⁵ To calculate per-capita consumption, first, we construct each household's weekly food consumption by summing up the reported amount of weekly food consumption and the estimated weekly self-consumption. Then we divide the household's weekly food consumption by the number of household members to ascertain the per-capita weekly food consumption. In estimating the amount of self-consumption, we first calculate the median state price of each item using each household's reported amounts of weekly purchase and the expenditure on the item. Then we multiply the amount of reported self-consumption by the estimated unit median price of the state.

⁶ Banco de México Estadísticas: <http://www.banxico.org.mx/estadisticas/index.html>

⁷ The high percentage of poverty head count ratio depends on the fact that the ENCEL sample villages are chosen from the most marginal rural areas throughout the country.

⁸ Mexico imports only yellow maize for industrial processes and cattle feed. Domestic production of white maize for tortillas satisfies the national demand (Tani 2012).

⁹ Wholesale prices of Mexico City are used because of the limit of data availability. Only prices in Mexico City, Guadalajara (second biggest city) and Puebla (one of the ENCEL pilot state near Mexico City) are available. We should note that the price trends of these three cities turned out to be very similar throughout the period. Wood et al. (2009) also conclude that there is little regional variation in the change in tortilla prices.

¹⁰ With respect to other major Mexican staples, rice prices also increased during the same period, but black bean prices were maintained until 2008.

¹¹ About 60 percent of the sample households cultivated lands whose median surface is 2 ha. and 90 percent of them are rain-fed in 2003.

¹² Only the households of which the ID matched in both years were selected. Households that did not report their expenditures were also dropped from the sample.

¹³ In 2007, PROGRESA-Oportunidades added to their grant 50 pesos per month which were labeled as a subsidy for energy consumption (Attanasio et al. 2009).