

**Poverty dynamics in rural Mexico:  
What does the future hold?**

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**Abstract**

We use panel data from the 2002-2007 period to analyze poverty dynamics in rural Mexico. The poverty measures show almost three fifths of the surveyed households experienced poverty at least once, while one fifth were cataloged as chronically poor. Additionally, asset accumulation dynamics show that there is low asset mobility and that the level of welfare Mexican rural households are expected to reach in the long run would be above poverty, but still quite low (per capita income equal to 6.35 times the Mexican food poverty line).

**JEL Classification:** I32, O12.

**Keywords:** Mexico, Household Welfare Dynamics, Poverty Traps.

**Resumen**

Este trabajo utiliza datos panel para el periodo 2002-2007, a fin de analizar la dinámica de pobreza en el México rural. Los resultados muestran que durante este periodo, casi tres quintas partes de los hogares encuestados estuvieron bajo la línea de pobreza, por lo menos una vez, y una quinta parte se mantuvo en pobreza crónica. Además, la dinámica de acumulación de activos muestra un bajo nivel de movilidad en la posesión de activos, y un equilibrio de largo plazo que lograría llevar a todos los hogares rurales mexicanos por encima de la línea de pobreza, pero a un nivel que seguiría siendo relativamente bajo (un ingreso *per cápita* equivalente a 6.35 veces la línea de pobreza alimentaria).

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*Clasificación JEL:* I32, O12.

*Palabras Clave:* México, dinámica de bienestar de los hogares, trampas de pobreza.

## **Introduction**

Recent research shows a process of gradual poverty alleviation in Mexico in the years that followed the Mexican 1994 economic crisis but prior to the 2007-2008 global financial crisis (see Cortés *et al.*, 2003; Székely, 2005; Galindo, Escajeda, and Galindo, 2009). In many regions of rural Mexico, however, limited economic opportunities, poor education, and lack of productive assets remain the norm. Therefore, considering that poverty can be a long-duration self-reinforcing event, a forward-looking approach to rural poverty is required not only in order to measure current poverty but also to estimate how many of the currently poor are likely to remain poor in the future.

The purpose of this study is to analyze poverty dynamics in rural Mexico and to determine if certain subgroups are more likely than others to remain poor in the long run. We move beyond the traditional measurement of poverty to analyze poverty transitions as well as to distinguish deep-rooted persistent poverty from poverty that decreases over time. The paper is organized as follows: section 1 describes the basic characteristics, methodology and limitations of the four poverty measurement approaches. In Section 2, we implement these different approaches using panel data from the 2002-2007 period. Conclusions of the analysis are presented at last.

## **1. Poverty Analysis Methodology**

Following Carter and Barrett (2006), we apply four alternative approaches to measure poverty using income and productive assets as units of measurement. This combination of approaches allows us to obtain a better understanding of the characteristics of poverty in rural Mexico.

The first approach relies on the commonly used FGT measures proposed by Foster, Greer and Thorbecke (1984). The FGT index is defined as:

$$P_{\alpha} = \frac{1}{N} \sum_{i=1}^N I_i \left( \frac{\bar{y} - y_i}{\bar{y}} \right)^{\alpha} \quad (1)$$

where  $N$  is the sample size,  $\bar{y}$  is the poverty line,  $y_i$  is the flow-based measure of welfare (in this case income),  $I_i$  is an indicator variable taking value one if  $y_i < \bar{y}$  and zero otherwise, and  $\alpha$  is a parameter reflecting the weight placed on the severity of poverty. Setting  $\alpha=0$  yields the poverty headcount ratio  $P_0$  (the share of a population falling below the poverty line). The higher-order measures  $P_1$  and  $P_2$  correspond with the poverty gap and the squared poverty gap.

One of the main drawbacks of this first approach is its incapability of distinguishing if a specific subpopulation remains in poverty over time or if poverty is a transitory phenomenon. In order to overcome this limitation we proceed to the second measurement approach suggested by Carter and Barrett (2006), in which panel data is used to calculate an income poverty transition matrix. This matrix is shown in Table 1. Households are classified into three categories: the always poor, the sometimes poor, and the never poor. Households that are always poor are considered to be chronically poor while those that are sometimes poor are referred to as transitorily poor.

Table 1  
**Decomposition of all Possible Income and Asset Poverty Dynamics**

<b>Income Poverty Transition Matrix</b>		
	$y_{it} < \bar{y}_t$	$y_{it} \geq \bar{y}_t$
$y_{it-1} < \bar{y}_{t-1}$	1. Always poor	3. Got ahead
$y_{it-1} \geq \bar{y}_{t-1}$	2. Fell behind	4. Never poor
<b>Asset Poverty Transition Matrix</b>		
	$A_{it} < 1$	$A_{it} \geq 1$
$A_{it} < 1$	a. Always below asset poverty line	c. Asset accumulation
$A_{it-1} \geq 1$	b. Asset loss	d. Always above asset poverty line

Source: by authors.

To overcome the main disadvantage of this second measure, its inability to distinguish structural from stochastic poverty, we move on to the third approach. Carter and May (1999, 2001) set the framework for what is known as third-generation poverty measurement. They characterize poverty in terms of the livelihood systems that link social and economic endowments to income possibilities. Their reformulation of poverty measurements from income to asset space introduces the concept of an asset poverty line (the

level of assets that would map to a level of income equal to the income poverty line). In their model, households that own bundles of assets above the asset poverty line should be able to obtain income above the income poverty line. However, there are constraints that may limit households' ability to effectively utilize their productive assets to generate income. This suggests that poverty is a matter not only of having few assets, but also of facing constraints that limit the effectiveness with which those assets can be used (Carter and May, 1999).

Based on households' ownership of physical assets and entitlements, third-generation poverty measurement allows us to compare a household's asset-based expected level of welfare to the actual income obtained. Given that comparison, a household's low level of income may be defined as a stochastic or structural poverty phenomenon depending on whether the expected level of welfare is located above or below the asset poverty line. For example, there may be a household obtaining a level of income below the poverty line even though its asset-based expected level of welfare is above the poverty line, in which case we say that this household's poverty is a stochastic phenomenon instead of a structural one.

The construction of a one-dimensional asset-based index that reflects a household's expected level of well-being is a key step for third-generation poverty measurement. Constructing an index of asset wealth requires selecting a set of weights for each asset such  $A_1 = \hat{\alpha}_1 \alpha_{1i} + \dots + \hat{\alpha}_K \alpha_{Ki}$ , where  $A_1$  is the asset index that results from adding assets  $\alpha_1, \dots, \alpha_K$  according to their assigned weights  $\alpha_1, \dots, \alpha_K$ . The main discussion in the construction of an asset index is how to determine these weights instead of imposing them arbitrarily. Filmer and Pritchett (2001) use Principal Component Analysis (PCA) to aggregate several binary asset ownership variables into a single asset index.<sup>1</sup> On the other hand, Adato, Carter and May (2006) and Naschold (2012) suggest a livelihood regression as a method for the construction of an asset index that offers a more intuitive interpretation of the index' units. The livelihood regression is the approach followed in this work.

A livelihood regression expresses a household's well-being as a function of its characteristics and asset holdings. Let  $y_{it}$  be a household's real income and  $S_{it}$  its subsistence needs (in our case this is defined as household size times the food poverty line). Let  $I_{it}$  be a measure of household's  $i$  livelihood at time, expressed as the ratio of its real income to its subsistence needs:

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<sup>1</sup> It is worth noting that because PCA was created for the aggregation of several continuous variables into a single one, the application of PCA to discrete asset variables has been criticized. Kolenikov and Angeles (2004) propose as an alternative the use of polychoric PCA, a technique that incorporates the use of discrete data into PCA.

$$I_{it} = \frac{y_{it}}{S_{it}} = \frac{y_{it}}{\text{householdsize}_{it} * \text{foodpovertyline}_t}$$

Hence,  $I_{it}$  measures a household's well-being in Poverty Line Units (PLU's). This variable equals one when the average income of the household members is exactly equal to the food poverty line and  $I_{it} < 1$  ( $I_{it} > 1$ ) indicates if household  $i$  is poor (non-poor) at time  $t$ . The following regression function relates livelihood of household  $i$  at time  $t$  to the bundle of assets owned by that household and its characteristics:

$$I_{it} = \alpha_0 + \sum_{K=1}^K \alpha_K \mathfrak{a}_{itk} + \sum_{t=2}^T \delta_t T_t + \varepsilon_{it} \tag{2}$$

The fitted values of this regression,  $A_{it}$ , can be interpreted as an asset-based index of household well-being in which assets and household characteristics ( $\mathfrak{a}_1, \mathfrak{a}_2, \dots, \mathfrak{a}_K$ ) are weighted according to their marginal contribution to well-being. Once the asset index has been constructed there is enough information to characterize each household's asset poverty dynamics by examining whether they are above or below the asset poverty line, which in this case is  $\bar{A}_t = \bar{A}_{t-1} = 1$ .

By combining each one of the cells of the income poverty transition matrix with a cell from the asset poverty transition matrix we are able to characterize all the different kinds of short-run poverty transitions. Table 1 presents both matrices. Starting with the transitions out of poverty, Cases 3a and 3b both represent temporary spells of good luck in which a household's income above the poverty line in period  $t$  is not supported by an asset index above the asset poverty line. These households are stochastically non-poor in period  $t$  and are not expected to maintain their non-poor status over time. Alternately, households in Case 3d were initially poor because of a negative shock and the transition to the non-poor state reflects a return to an expected non-poor standard of living. Finally, Case 3c represents the structural transition to a non-poor state due to the accumulation of new assets or enhanced returns to existing ones.

Following a similar logic, it is possible to identify stochastic from structural poverty transitions among those falling into poverty. Cases 2c and 2d are the result of a temporary spell of bad luck in period  $t$  for a household that was not poor in period  $t - 1$ . Case 2a is the result of falling back into poverty

after an episode of good luck. The structural poverty transition in Case 2b, results from loss of assets or a decrease in the returns to assets possessed.

Among households identified as always poor it is possible to identify those that were structurally poor in period  $t - 1$  and over time failed to accumulate the assets and entitlements related to obtaining a level of income above the poverty line in period  $t$  (Case 1a). The rest of the always poor, Cases 1b, 1c, and 1d, are households who have an asset base that would be expected to yield a livelihood above the poverty line but were pushed below it by negative livelihood shocks in the initial period (Case 1b), the final period (Case 1c) or in both periods (Case 1d). Finally, among the never poor, it is also possible to distinguish between the structurally never poor (Case 4d) and the rest of the households that have experienced positive shocks in either the initial period (Case 4c), the final period (Case 4b) or both periods (Case 4a).

As pointed out by Adato *et al.* (2006), identifying the currently structurally poor from the third-generation poverty analysis does not tell us whether the households are on a trajectory of asset accumulation that will allow them to eventually exit poverty in the long term or whether the households are caught in a poverty trap. Therefore, a fourth poverty measurement approach is needed to examine the possible existence of poverty traps based on an understanding of underlying patterns of asset dynamics and to determine if certain households are expected to remain persistently poor over the long term.

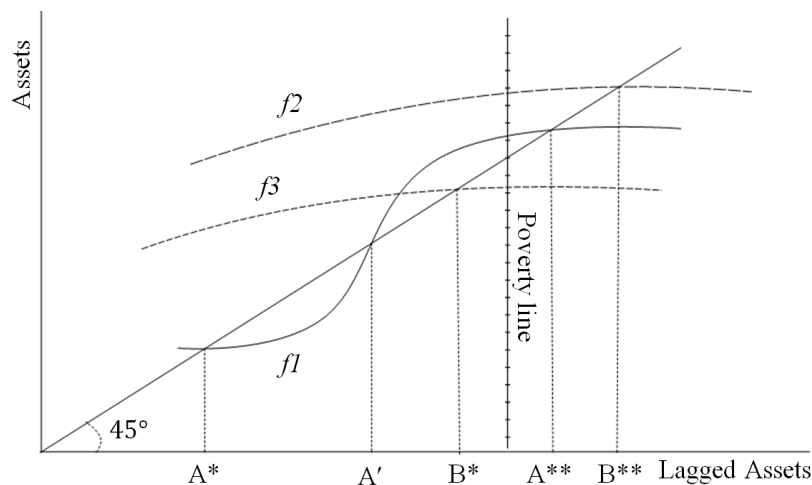
Azariadis and Stachurski (2004) define a poverty trap as any self-reinforcing mechanism that causes poverty to persist, which may occur at any scale from individuals to families, communities, regions, and countries. There are several models in the development literature that capture different mechanisms that may lead to multiple steady states and poverty traps (Galor and Zeira, 1993; Banerjee and Newman, 1993). In this work we aim to test for the existence of poverty traps that arise due to the existence of critical thresholds. To do so we follow the work of Carter and Barrett (2006). They propose a poverty trap mechanism for agrarian communities characterized by the existence of high-return productive activities that are available only to households that can afford to invest in them. For example, there may be higher-return crops and agronomic practices only available to households who reach a critical scale of operation. Relatively wealthy households may afford the sunk costs necessary to undertake a productive investment while poor households may not.

According to their model, households adopting a higher-return productive activity reach a higher steady-state value of welfare. Households that

maintain the lower-return productive activity are caught in a lower level of welfare and will only be able to escape from it if they can afford to switch to the higher-earning strategy. Therefore, the key question is whether households with the lower-return productive activity will be able to reach the level of wealth where increasing returns occur and afford to switch to the higher-return productive activity. This minimum level of wealth at which households find it feasible to make the necessary sacrifices to save and switch to the higher-return productive activity is called the Micawber threshold. Finding a Micawber threshold, based on observed behavior, separates households lacking the assets and entitlements needed to escape poverty over time from those engaged in a cycle of asset accumulation that may lead to better standards of living in the future.

Function  $f1$  in Figure 1 shows the basic logic of Carter and Barrett's (2006) model. It illustrates the S-shaped dynamics of a model with two stable equilibria ( $A^*$  and  $A^{**}$ ) and a Micawber threshold ( $A'$ ), an unstable equilibrium where the asset accumulation bifurcates. For a model with these characteristics, the value  $A^*$  denotes the steady-state equilibrium yielding a low level of income to all households restricted to the lower-return productive activity. The equilibrium  $A^{**}$  denotes the same thing for the higher-return productive activity. Because  $A^*$  is located below the poverty line any individual who settles into equilibrium at  $A^*$  would be caught in a poverty trap even though a higher non-poor equilibrium exists.

Figure 1  
**Asset recursion diagram that illustrates multiple dynamic equilibria dynamics and conditional convergence dynamics**



Source: by authors.

Extending the logic of Carter and Barrett's framework, the possibility of a single equilibrium can also be illustrated. For example, function  $f_2$  illustrates the case in which there is no poverty trap and households unconditionally converge to an equilibrium  $B^{**}$  above the poverty line. In contrast, households whose asset dynamics behave as in function  $f_3$  would be expected to reach  $B^*$ , a single steady-state stable equilibrium located below the poverty line.

The literature in development microeconomics offers empirical tests to detect the existence of poverty traps. The core hypothesis is that multiple dynamic equilibria might exist and thus that initial conditions matter to subsequent income or wealth accumulation trajectories (Lybbert, Barrett, Desta and Coppock, 2004). Following Barrett *et al.* (2006) and Lybbert *et al.* (2004), we use parametric and semiparametric regression techniques to estimate the levels of well-being that households are expected to reach over time.

## 2. Data and results

The data for this study is taken from the first two rounds of the Mexican National Rural Household Survey (ENHRUM), a collaborative project between the Colegio de México and the University of California, Davis. The first round of the survey was completed in early 2003 (the data is for the year 2002) and the second in early 2008 (the data is for 2007). The sampling strategy was designed by the Mexican National Institute of Statistics and Geography to be representative of Mexican rural communities with populations between 500 and 2,499 habitants (representing more than 80% of Mexico's rural population).<sup>2</sup> The country was divided into five regions<sup>3</sup> and 16 villages were selected from each region. The sample consists of more than 1,700 randomly selected households located in eighty villages from 14 Mexican states. In this study we use a panel consisting of 1,529 households.<sup>4</sup>

An important first step in our study was to approximate household income. Detailed data on all household productive activities allows for the estimation of total income for each household in the ENHRUM sample. Total income is

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<sup>2</sup> We focus on rural communities where poverty is more prevalent; in 2008, the poverty headcount in rural communities was three times that of urban communities (CONEVAL, 2010).

<sup>3</sup> These regions are: South-Southeast (Oaxaca, Veracruz and Yucatán), Center (Estado de México and Puebla), Center-West (Guanajuato, Nayarit and Zacatecas), Northwest (Baja California, Sonora and Sinaloa), and Northeast (Chihuahua, Durango and Tamaulipas).

<sup>4</sup> We used the data from 2002 to test if there was evidence of non-random attrition but did not find any.



constructed by adding income from six different sources: family production (crop, livestock, non-agricultural, commerce, services, and natural resource extraction), agricultural wage labor, non-agricultural wage labor, internal migrant remittances, international migrant remittances, and public transfers. For poverty estimations we took the official poverty lines<sup>5</sup> provided by CONEVAL (2009).

Table 2  
**Foster-Greer-Thorbecke Poverty Measures**  
**(National and by region)**

	Headcount		Poverty Gap		Squared Poverty Gap	
	$P_0$		$P_1$		$P_2$	
	2002	2007	2002	2007	2002	2007
Mexico	39.3	35.6	22.7	19.9	19.6	16.8
South-Southeast	64.5	50.3	35.9	25.6	25.1	20.8
Center	39.3	41.1	19.2	23.4	19.4	21.0
Center-West	32.1	29.8	19.4	15.3	19.5	11.2
Northwest	21.5	25.8	13.2	16.2	11.9	13.4
Northeast	36.5	27.7	25.3	17.7	21.5	16.9

Source: calculations by authors.

Table 2 shows the results of measuring the three main variants of the FGT index at the national and regional level. In 2002, almost 40% of Mexican rural households were below the poverty line, while in 2007 this decreased to 36%. During both years the region with the highest percentage of poor was the South-Southeast (65% and 50%). A similar pattern prevails when we look at the two other poverty measures. By looking at short-run poverty transitions (Table 3) we get a better feel of poverty dynamics in rural Mexico. Only 19% of the surveyed households were poor in both 2002 and

<sup>5</sup> In Mexico, the National Council for the Evaluation of Social Development Policy (CONEVAL) is in charge of establishing the guidelines to determine the poverty line that relates to each of the following definitions of poverty: food poverty (incapability to acquire a basic food basket), capabilities poverty (insufficiency of the available income to acquire the food basket value and make the necessary expenses in health and education), and patrimonial poverty (insufficiency of the available income to acquire the food basket, as well as to make the necessary expenses in health, education, clothing, housing and transportation). For this study, the annual food poverty lines are 5,937.36 pesos for 2002 and 6,089.52 pesos for 2007. The exchange rate during the period was approximately 11 pesos per dollar.

2007 and 44% were above the poverty line in both periods. On the other hand, half of the households classified as poor in 2002 were above the poverty line in 2007, while 28% of households classified as non-poor in 2002 fell into poverty in 2007. This shows that rural transitions into and out of poverty were relatively common in Mexico during this period.

Table 3  
**Poverty Transition Matrix**

		2007	
		Poor 36%	Non-poor 64%
2002	Poor 39%	Always poor: 19%	Got out of poverty: 20%
	Non-poor 61%	Fell into poverty: 17%	Never poor: 44%

Source: calculations by authors.

In order to empirically distinguish between households that can be expected to escape poverty over time from those that cannot we use the livelihood-weighted asset index methodology described in Section 1 and calculate a transition matrix that combines the income and asset poverty transition matrices. The livelihood regression (Equation 2) was estimated using a random effects model.<sup>6</sup> The assets included captured the financial, productive and human capital of the households (see Table 4).<sup>7</sup>

<sup>6</sup> A Hausman test failed to reject the null hypothesis that the coefficients of the random and fixed effects models are the same so we decided to use the most efficient model.

<sup>7</sup> As a robustness check we constructed an asset index using the first principal component from a polychoric PCA as suggested by Kolenikov and Angeles (2004). The results were very similar to those presented here.

Table 4  
Assets included in the asset index and mean values by period

Type of Capital	Subcategory	ENHRUM	2002	2007
Household	Household	Age of Household Head	48.97	53.69
Characteristics	Head	Squared Age of Household Head	2,638	3,120
		Gender of Household Head	87%	86%
		Education of Household Head	4.50	4.49
Physical Capital	Housing	Number of rooms	2.92	3.08
		Kitchen	94%	87%
		Wall Material:		
		<i>Perishable materials</i>	3%	2%
		<i>Wood or metal</i>	14%	11%
		<i>Block or adobe</i>	24%	24%
		<i>Brick or stone</i>	59%	64%
		Roof Material:		
		<i>Brick</i>	0%	0%
		<i>Cardboard</i>	1%	1%
		<i>Tile</i>	5%	5%
		<i>Metal</i>	38%	34%
		<i>Perishable materials</i>	7%	4%
<i>Wood</i>	10%	11%		
<i>Concrete</i>	38%	44%		
Windows:				
<i>No windows</i>	8%	8%		
<i>No glass</i>	28%	20%		
<i>Glass</i>	65%	73%		

Continue on next page.

Table 4... Continue  
**Assets included in the asset index and mean values by period**

Type of Capital	Subcategory	ENHRUM	2002	2007	
Physical Capital	Housing	Bathroom:			
		<i>No bathroom</i>	10%	5%	
		<i>Latrine</i>	43%	36%	
		<i>Toilet</i>	47%	60%	
		Water supply	82%	84%	
		Drainage	25%	32%	
		Electricity	94%	98%	
		Telephone	23%	36%	
		Refrigerator	59%	74%	
		Cooking Fuel:			
	<i>Other fuel</i>	0%	0%		
	<i>Both firewood and gas</i>	29%	26%		
	<i>Firewood</i>	29%	36%		
	<i>Gas</i>	41%	39%		
	Land	Land	5.14	5.29	
		(Land) <sup>2</sup>	745	760	
	Livestock	Cows	1.39	1.48	
Calves		0.58	0.71		
Bulls and oxen		0.12	0.14		
Horses		0.21	0.27		
Donkeys		0.14	0.13		
Financial/ Productive Capital		Productive durables	Automobile	0.15	0.19
			Truck	0.18	0.25
	Tractor		0.04	0.05	
	Cultivator		0.01	0.03	
	Mill		0.01	0.04	
Transfer income	Number of household members in the US	Transfers	666.95	682.58	
		(Transfers) <sup>2</sup>			
		Transfers*Land	7,405	6,288	
Human Capital	Languages	Spanish	82%	80%	
		English	1%	4%	
	Health	Bad	40%	35%	
		Average	9%	14%	
		Good	51%	51%	

Source: calculations by authors.

The transition matrix is shown in Table 5. Results indicate that among households identified as always poor, 23% were structurally poor in 2002 and failed to accumulate assets and entitlements related to obtaining a level of income above the poverty line in 2007. Among households who were poor in 2002 and moved ahead in 2007, 14% received positive stochastic shocks that pushed them above the poverty line in 2007, but they lacked the necessary asset base to be expected to maintain their non-poor status over time. On the other hand, 73% were unlucky in 2002 but returned to their expected non-poor level of income in 2007.

Table 5  
**Poverty Transition Matrix and Third Generation Poverty Measures**

		2007	
		Poor 36%	Non-poor 64%
2002	<b>Poor 39%</b>	<b>19% Always poor, of which:</b> 23% Structurally-poor in both periods  77% Negative stochastic shocks	<b>20% Got ahead, of which:</b> 14% Stochastically-non-poor in 2007  73% Non-poor who were unfortunate in the initial period  13% New structurally-non-poor, accumulated assets to become structurally non-poor in 2007
	<b>Non-poor 61%</b>	<b>17% Fell behind, of which:</b> 88% Stochastically-poor in 2007  7% Poor who were fortunate in the initial period  5 % New structurally-poor, lost their initially non-poor asset base and became structurally poor in 2007	<b>44% Never poor, of which:</b> 84% Structurally non-poor in both periods  16% Positive stochastic shocks

Source: calculations by authors.

Among households who were non-poor in 2002 and fell behind in 2007, 88% received negative stochastic shocks that made them poor although they were expected to be non-poor in 2007. The rest of the households in this category were either initially lucky or lost part of their asset base and experienced a structural transition into poverty. Finally, among the never poor, it is possible to distinguish a group of households that have accumulated an asset base that supports their structurally non-poor level of income in both periods (84%).

This third-generation poverty measure provides valuable information about how likely it is for poverty to persist in the short term. It does not, however, say anything about the long-term dynamics of asset accumulation, and therefore about the potential existence of poverty traps. Hence, the final step of our analysis was to use fourth-generation poverty measures to look at the long-term poverty trend in rural Mexico.

The first econometric technique used is the parametric polynomial model. In this model, control variables are introduced in a linear form (except the age of the household head since its squared value is also included) while the asset index for the initial year is included as a fourth-degree polynomial. The control variables used in the econometric analysis are the household head's age, gender and education, as well as household size and household members' education. The parametric analysis is complemented with a kernel-weighted regression, a semiparametric technique with no assumptions on the functional form of the relationship between the asset index and its lagged value (see Pagan and Ullah (1999) and Ruppert, Wand and Carroll (2003) for more details on this econometric technique).

Figure 2 shows the results of the econometric estimation used to test the existence of a poverty trap.<sup>8</sup> There are only slight differences between the two estimation techniques. Most importantly, both techniques show similar evidence of non-linear dynamics towards the tails of the distribution, but an almost linear behavior in the middle. On the one hand, at low values of the asset index the confidence bands of the estimations are fairly close to the 45-degree line, which suggests a low, or even null, level of asset mobility. This goes in line with Naschold's (2012) findings in the sense that the "poor stay poor". On the other hand, at relatively higher levels of the asset index there

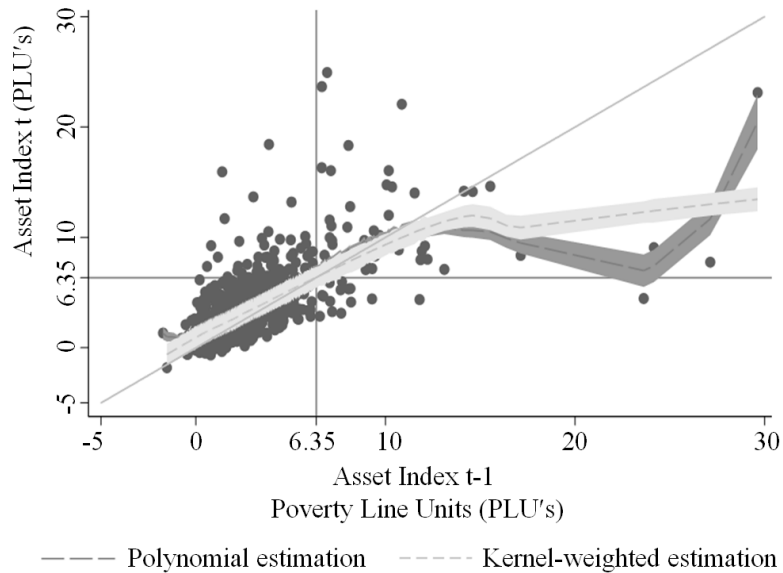
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<sup>8</sup> Considering that the objective is to test for the existence of multiple equilibria and not to estimate the marginal effects of the control variables, the full econometric results are not shown; the coefficients for household head's age, gender and in some models the number of members with elementary school were statistically different from zero.

is evidence that there might be a single stable equilibrium shared by the whole surveyed rural population.<sup>9</sup>

Given the latter interpretation of the results the relevant question is: what would this equilibrium level of welfare be relative to the poverty line? Figure 2 shows that this equilibrium is located around 6.35 poverty line units (this means that, in equilibrium, an individual lives with approximately 105 pesos per day). This interpretation imply that, in the absence of stochastic shocks, Mexican rural households are expected to reach a common long-term level of wealth that is slightly more than 6 times the food poverty line.<sup>10</sup>

Figure 2  
Polynomial and Kernel-Weighted Estimation Results



Note: 90% confidence bands shown.  
Source: calculations by authors.

<sup>9</sup> An additional semiparametric technique was used: penalized splines. The results, not shown, are similar to those presented in Figure 2 with the exception that with penalized splines we find additional equilibrium to the left of the one reported here. The additional equilibrium does not affect our conclusion that there is no evidence of a poverty trap so we decided to focus on the results obtained with polynomial and kernel estimations.

<sup>10</sup> This equilibrium is also bigger than the capabilities poverty line and the patrimonial poverty line mentioned in footnote 5.

Table 6  
**Stable Dynamic Asset Equilibria by Subgroups**

	<b>Number of Observations</b>	<b>Approximate location of stable equilibrium in food poverty line units</b>	<b>Approximate location of stable equilibrium in pesos per-capita per-day</b>
<i>All</i>	1,529	6.35	105.94
<i>By Region</i>			
South-Southeast	332	3.68	61.40
Northwest	298	5.06	84.42
Center-West	312	5.21	86.92
Center	338	7.26	121.12
Northeast	249	12.00	200.20
<i>By Household Head Gender</i>			
Female	206	5.39	89.93
Male	1,323	7.41	123.63
<i>By Education of Household Head</i>			
Up to 5 years	905	6.88	114.78
Primary school or more	624	9.96	166.17
<i>By Land Ownership</i>			
No land	746	3.90	65.07
0 < Land < 5 ha.	465	6.60	110.11
More than 5 ha.	318	7.42	123.79

Source: calculations by author.



Table 6 shows the results of convergence patterns at the regional level as well as for different groups.<sup>11</sup> A single stable equilibrium exists for every region. However, although all regions are expected to overcome poverty over time, there is considerable difference in the levels of welfare they are expected to reach. The Center, Center-West and Northwest regions share a similar equilibrium level of around 5-7 food PLU's.

On the other hand, the South-Southeast converges to a lower-level equilibrium of 3.68 food PLU's (61 pesos per capita per day) and the Northeast region converges to a higher-level equilibrium of 12 food PLU's (200 pesos per capita per day). Households headed by a male are expected to reach a higher equilibrium than households headed by a female. Meanwhile, an equilibrium level close to 10 PLU's was found for those households whose head had completed primary school. In comparison, households whose head had not completed at least 6 years of education are expected to reach an equilibrium of 6.88 PLU's. The analysis by amount of land owned shows that households that do not own land (almost half of the surveyed households) are expected to reach a low-level equilibrium around 3.90 PLU's. In contrast, small landholders (less than or equal to 5 ha.) reach an equilibrium of 6.60 PLU's and households that own more than 5 ha. (20% of surveyed households) reach an equilibrium of 7.42 PLU's.

## **Conclusions**

Our results show that, according to the most basic poverty measurement approach used, more than one third of the Mexican rural population was poor at some point between 2002 and 2007. The second approach, based on comparisons of poverty status over time using panel data, shows that almost three fifths of households experienced poverty in at least one of the two periods considered. Additionally, although 36% of households were considered poor in 2007, only 7% were structurally poor. On the other hand, although 64% of households were non-poor in 2007, only 58.6% were structurally non-poor. This means that 41.4% of the surveyed households are vulnerable either because they are structurally poor or because they face constraints limiting their ability to effectively utilize their assets and endowments.

Finally, the asset-based welfare dynamics approach that tests for the existence of poverty traps shows a low, or even null, level of asset mobility. One way to interpret our results is that poor households are expected to

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<sup>11</sup> The idea of conditional convergence in this setting refers to groups of households who share similar intrinsic characteristics and that tend to follow an equilibrium path and converge to a living standard unique to the group.

remain poor. A more optimistic interpretation of our results points towards the existence of a non-poor equilibrium all rural Mexican households would be expected to reach in the long term. However, this long-run equilibrium would still be barely above the income needed to pay for basic health, education, clothing, housing and transportation expenses in addition to the basic food basket (i.e. the so-called patrimonial poverty line). In any case, both low mobility and a low long-term equilibrium imply that welfare of rural households in Mexico is not expected to rise significantly given the current conditions.

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