Poverty Dynamics and Graduation from Social Protection: A Markovian Model for Mexico's *Oportunidades* Programme

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Abstract

The implementation of Social Protection Programmes has been supported by a vast amount of research on several features. However, the programme graduation is still an unexplored field of research. To date, a practical response from practitioners has been the withdrawal of ineligible participants with no considerations on how likely they are to become eligible back again in the future. We do not propose an intervention that could help household escape poverty. Rather, we highlight the relevance of the implication of poverty dynamics for programme graduation and the conditions that participants should meet before transfers are phased out. Programme graduation is only possible when non-poor participating households have low probabilities of becoming poor or eligible. We offer a conceptualisation of poverty or eligibility dynamics and provide an empirical approach with the Mexican Family Life Survey-I, II and III. By estimating a Markovian poverty transition model, we find that the programme could graduate 28.9 and 26.7 percent of ineligible non-poor households in urban and rural areas, respectively. After suggesting an income Graduation Line, we also find that the recertification of socioeconomic conditions should take place every 3.5 and 4.1 years in urban and rural areas, respectively.

Keywords: Poverty dynamics, Social Protection, Conditional Cash Transfers, Markovian models, Mexico, *Oportunidades*.

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1. Introduction

Within anti-eligibility strategies, governments in developing countries have increasingly implemented Social Protection Programmes (SPPs). In the particular case of human development conditional cash transfer (CCTs) in Latin America, it is estimated that about 100 million people have receive the benefits of such interventions since the mid-1990s (Stampini and Tornarolli, 2012). In Mexico, Brazil and Colombia, the exposure of some beneficiaries to CCTs has been longer than ten years (Accion Social, 2010; Barrientos, 2013; Behrman et al., 2008). These programmes have developed rigorous proxy-means tests that identify households in poverty and, particularly, eligible to receive benefits.

Eligibility is relevant when there is a response to conditions of deprivation; poverty is a necessary but not sufficient fact generating such response. In the context of the implementation of SPPs, poverty and eligibility could be treated as synonyms.[1] In a longer term horizon, beneficiary households, particularly those closer to the poverty or eligibility line, are likely to experience poverty and non-poverty spells that can switch their status from eligible to ineligible to receive the programme entitlements and *vice versa*.

To date, there has been little agreement on how a SPP should respond when a beneficiary becomes non-poor or ineligible in time $t-1$, and falls back into poverty or eligibility in time t. In the context of developing countries, some SPPs have adopted the concept of *programme graduation*, consisting of detecting households that have moved up the income ladder to cross the poverty line, to become no longer eligible to receive programme benefits. In such cases, the usual response has been to simply 'graduate' those households by reducing the benefits or dropping them altogether from the programme entitlements. Mexico's CCT, *Oportunidades*, implements a recertification of recipients' socioeconomic status every three years. When a household becomes ineligible due to not being poor, the programme administrators either drop the household from the programme altogether or reduce current benefits according to the household's predicted income.[2] The problem with such approach is that it ignores the possibility of ineligible households exhibiting non-positive trajectories in their economic mobility, and being therefore at the risk of becoming poor again and programme eligible in the future.

Poverty dynamics can be affected by previous participations in SPPs. The scant existing literature on poverty and subsequent eligibility dynamics highlights that households or individuals with previous participation in SPPs are more likely to participate in the future (Andrén, 2007). One explanation is what Sen (1995) calls "incentive distortion" in which households can change their

[1] The relation between eligibility and eligibility dynamics is straightforward. Eligibility status determines eligibility to SPPs. Their relation becomes relevant when SPPs target with means tests or proxy means tests that attempt to identify households or individuals in poverty. Being in poverty is a necessary but insufficient condition to become eligible. The latter is because programmes can make targeting errors, identifying as poor someone who really is not in eligibility. If targeting errors are constant overt time, eligibility and eligibility dynamics can follow a similar trend. In absence of targeting errors, eligibility and eligibility dynamics are exactly the same.

[2] See for example an analysis of ineligible households made by González-Flores et al. (2012) on the Mexico's *Oportunidades* programme. In particular, when households are found ineligible the administrator delivers either a differentiated benefit or definitely stops the transfers. The authors examined the upward mobility of current participants in order to determine which households characteristics make them be classified as ineligible.

behaviour in order to keep their eligibility status.[3] Jenkins and Cappellari (2008) encompass these ideas referring to the "state dependence," indicating that current household's eligibility status may be dependent on previous eligibility experience.[4] Therefore, the discussion on graduation from SPPs should not be limited to the ineligibility status of current beneficiaries. As SPP identify and distribute transfers to households in poverty, this paper assesses the likelihood of current ineligible households to fall into poverty and become eligible programme participants. Programme graduation is implicit only when non-poor households exhibit low probabilities of future poverty spells and, thus, of becoming again eligible to the programme entitlements.

The issue of poverty and consequent eligibility dynamics has been examined using various analytical frameworks gravitating around the estimation of vulnerability to poverty, expected utility or uninsured risk with very few agreement on which method is sufficiently robust to address the number of assumptions upon which these approaches are based (Hoddinott and Quisumbing, 2008). In this paper poverty or eligibility dynamics are assessed by the observation of poverty spells or transitions of current and potential beneficiaries of Mexico's *Oportunidades* programme.

Using a three-round panel dataset from the Mexican Family Life Survey-MxFLS, this paper looks at those households that were identified as non-poor or ineligible to the programme in the baseline period (MxFLS-I) but were then classified as eligible in the follow up surveys (MxFLS-II and III). A Markovian model of multivariate normal probability simulation is estimated following Cappellari and Jenkins (2004, 2008) and Jenkins (2011) to study the poverty dynamics while taking into account three important elements. First, it controls for unobserved heterogeneity that can bias the estimation results. Second, it considers the possibility of self-selection bias associated with behavioural changes towards eligibility, as the result of state dependency from previous participation. Finally, it accounts for potential bias arising from attrition within panels.

This paper contributes to existing literature on the overall social policy in several ways. First, it examines the implications of poverty dynamics for the 'graduation' of SPP. To the best of our knowledge, this is the first study that provides a framework for a generic graduation condition, in the sense that it can be applied to any SPP selecting beneficiaries with means or proxy mean tests. Second, it provides an empirical analysis of Mexico's *Oportunidades* (before known as *Progresa*), which is the flagship antipoverty social protection programme in the country, and has been a general reference for the replicability of similar strategies in other countries (Barrientos and Villa, 2013; Nino-Zarazua, 2011). Several design features of *Oportunidades* have been the subject of extensive analysis, including the targeting mechanisms, transfer size and periodicity and general operations rules. The conceptualization and empirical approach adopted in this paper provide parameters for the assessment of graduation rules more specifically.

The remaining of the paper is structured as follows. Section 2 discusses the importance of poverty dynamics in the context of SPPs. Section 3 examines the graduation strategy of *Oportunidades* programme; Section 4 presents the methodology, whereas Section 5 describes the longitudinal Mexican Family Life Survey (MxFLS) used for empirical analysis. Finally, Section 6 presents the results of the study while Section concludes with reflections on policy.

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[3] Kanbur et al. (1994) explore the implications of labour incentives to programme eligibility.
[4] See also (Carter and Barrett, 2006)

2. Poverty and eligibility dynamics

Understanding poverty dynamics is critical in the context of SPPs. The economic trajectory of households can display poverty and non-poverty spells that may influence the eligibility of households to receive programme benefits. As SPPs, such as *Oportunidades,* rely on means tests or proxy-means tests to identify and select beneficiaries based on targeting tools which are mostly static, programme administrators may incur in *prospective* exclusion errors by dropping beneficiaries who become ineligible after crossing the poverty line in time $t-1$ but fall back again in time t.

Hulme and Shepherd (2003) provide a clear idea on how poverty and consequent eligibility dynamics can affect the performance of a SPP in their conceptualisation of chronic poverty.[5] In the categorisation of households, there are two aggregate groups broadly considered chronic poor and transient poor.[6] Two different sub-groups can be identified within the chronic poor, namely, always poor and usually poor. The always poor experience persistent poverty without being classified as non-poor over a given period. Improvements tend to occur gradually, while declines tend to arise abruptly. Usually poor households or individuals fluctuate sporadically under and above the poverty line. This is also known also a saw-tooth trajectory (Davis, 2009). Usually poor suffer from chronic poverty and could be ineligible to SPPs for a short period over their life course. Similarly, transient poor are those who escape poverty but can fall below the poverty line or eligibility thresholds. In fact, transient poor can be divided into churning poor and occasionally poor. Churning poor are those whose classification between poor and non-poor fluctuates below and above the poverty line with a seasonal pattern, especially in rural areas where households are able to work at temporary crops.[7] Occasionally poor are located most of the time above the poverty line or eligibility threshold but can experience a poverty period at least once in the long-term.

Figure 1 below aims to illustrate poverty dynamics and their implications for the implementation of SPPs. The vertical axis is divided by the poverty or eligibility line that classifies households or individuals between poor and non-poor, or eligible and non-eligible to SPPs. The horizontal axis represents the time line with hypothetical dashed milestones according to changes in household welfare status pattern. As regards eligibility dynamics, the dark line indicates the welfare level of a household initially classified as never poor that falls below the threshold later on. In fact, the occasionally poor household experiences transient poverty at point A, being eligible to SPPs for a while. SPPs find occasionally poor eligible to transfer programmes, but they might be identified as inclusion errors afterwards. A descending household could have experienced a negative shock that

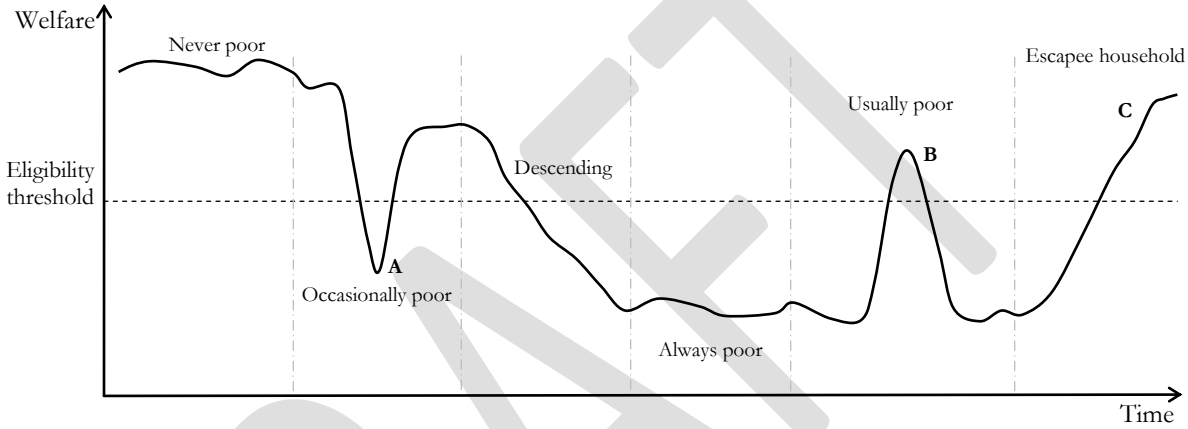
[5] Davis (2009) also provides a similar approach based on life experiences in Bangladesh. Hulme (2003, p. 399) defines chronic poor as "those individuals and households who experience eligibility for extended periods of time or their lives." Despite there is a field of the chronic eligibility that regards its measurement (Bossert et al., 2010), the intention here is to borrow the concept on the dynamics of the socioeconomic classification of the households. Baulch and Hoddinott (2000) provide a similar approach to eligibility dynamics.

[6] This discrimination is widely characterised by Jalan and Ravallion (2000) who regard transient eligibility as the varying component of consumption that can be mitigated by insurances or income stabilisation schemes. Similarly, they define chronic eligibility as the non-transient component that remains once consumption is smoothed. They consider that chronic eligibility can be mitigated with long-term investments in human and physical capital.

[7] See for example a seasonal approach by Dercon and Krishnan (2000).

pushed it below the threshold, as it was vulnerable to poverty at a critical point.[8] Always poor households are persistently under the poverty or eligibility threshold, with constant eligibility to any targeted intervention. Usually poor are households persistently poor in the long run but they can experience temporary non-poverty status. A SPP could stop the transfer to usually poor households at point B, ignoring that it will be eligible to the intervention in the future. SPPs make prospective exclusion errors when dropping usually poor households. Finally, the escapee household consolidates its classification by being non-poor in the long-term after point C. An ideal graduation rule must lead the implementation of SPPs to identify the latter.

Figure 1. Poverty or eligibility trends.



Central to this analysis, SPPs often deal with usually and occasionally poor households that experience poverty and non-poverty periods. Graduation rules could vary for each group of households as they are dependent on when the welfare status is assessed (Calvo and Dercon, 2009). If usually poor households are enrolled when eligible to the intervention, administrators could be tempted to stop the transfers at point B of Figure 1, as they ignore the risk of the household of becoming eligible later on. If the programme can determine whether households are experiencing chronic or transient poverty, the transfers might not be stopped. Contrary, if a household joins the SPP when poor or eligible, the programme could stop delivering the transfers at point C, where the risk or vulnerability to eligibility is significantly low and the household could be considered graduated from the intervention. The assessment of the household and the determination of its classification and transition probabilities can provide SPPs with accurate graduation strategies.

3. *Oportunidades*' graduation strategy

Oportunidades was launched in August 1997 with the aim of breaking the intergenerational cycle of poverty. To do so, the programme provides income supplements to poor households with children in exchange for certain commitments, such as regular school attendance and periodic health clinic

[8] Baulch (2011) tries to answer why a household or an individual falls into chronic eligibility. Among the causes he identifies the lack of resilience to negative shocks (idiosyncratic or covariant), especially when the affected household or individual is endowed with low levels of physical, natural, human, financial or social capital.

visits (Nino-Zarazua, 2011). The programme is centrally run by a federal agency that identifies and selects programme beneficiaries through a system that involves i) a geographic criterion for the selection of poor areas using a census-based marginality index; ii) a categorical criterion to identify eligible households with women in reproductive age, and iii) a proxy means test for which an estimated income below a food poverty line officially known as minimum welfare line (MWL) or below the capabilities line (CL).[9] Households are entitled to the programme if their predicted income is below the MWL, while they are graduated if their predicted income is above the CL (SEDESOL, 2013).

When a household joins the programme, its predicted earned income is intended to be recertified three years after enrolment. *Oportunidades*' operation rules indicate that the recertification process should be recertified between the third and sixth year and between the third and fourth year in rural and urban areas, respectively.[10] If the estimated income is higher than the MWL but lower than the CL, then the income supplement is are reduced in the subsequent three years over a pathway that is referred to as *differentiated support scheme* (DSS). During the DSS households are given a similar cash transfer except the one corresponding to the education component of children in elementary school. The role of the CL is relevant for the analysis of eligibility dynamics, as any household with income above that level is dropped from the programme.

Oportunidades' operation rules recognize the menace of poverty or eligibility dynamics by allowing 'graduated' beneficiaries to re-join the programme. However, the response has been so far limited as this can be done only four year after graduation. If the probability of future eligibility spells could be predicted, programme administrators could calibrate their decisions about whether to keep in, or drop from the programme, occasionally poor households experiencing temporary ineligibility.

4. Methodology

Modelling poverty dynamics have been largely shaped by approaches of vulnerability to poverty, although there is no consensus about concepts and measurement (Baulch, 2011). In general terms, two general approaches have been influential. The first approach is based on ex-ante estimates that predict the likelihood of a household or individual to fall below a given threshold of wellbeing dimensions (e.g. health, education, food consumption or income) overt *t* time periods (Briguglio et al., 2009; Calvo and Dercon, 2007; Chaudhuri et al., 2002; Dercon and Krishnan, 2000; Foster et al., 2010; Gaiha and Imai, 2004; Harttgen and Günther, 2007; Hoddinott and Quisumbing, 2008, 2008; Moser, 1998; Naude et al., 2009; Zhang and Wan, 2009). The second approach is based on binary transition matrices that estimate the probability of households in poverty to become non-poor, and non-poor households to become poor. Since *Oportunidades* relies on wellbeing thresholds that divide the population into eligible and ineligible that may depend on previous experiences of poverty and programme participation, the method used in this paper adopts the second approach to modelling poverty and consequent eligibility dynamics.

[9] It is also known as the permanent socioeconomic conditions verification line. The CL is the sum of the MWL adding average health and education expenses to the MWL.
[10] Community recertification is also considered every eight years.

More specifically, our approach is based on a Markovian model that estimate de probability of being poor (or eligible to receive a cash transfer) in period (t), contingent on the state dependence of being poor in period $t-1$, controlling for initial conditions effects and attrition in unbalanced panels.[11] Markovian models are convenient in cases of limited longitudinal information, as they only require pairs of t and $t-1$ periods. For simplicity's sake, from point on transitions are understood from the eligibility point of view.

Jenkins (2011) point out that Markovian models, which are expressed in terms of probability (probit or logit) estimations, are superior to alternative hazard regression models in several respects: first, their specification accounts for non-random attrition, which is modelled simultaneously with eligibility transitions. Second, the left-censored eligible spell of the first round of the panel dataset is internalized in the model. This is done by assuming that the current eligibility status depends on previous observable characteristics, which in turn predict the probability of being eligible in the next immediate period. This contrasts hazard regressions models that are based on predicting the duration of eligibility spells.

We could resort to a single probit model to assess the probability of a household falling into eligibility or remaining in it. In such a case, the observed covariates in period $t-1$ could be used as predictors of the eligibility status in period t. One potential problem in the interpretation of a single probit model is the possibility of having unobserved heterogeneity arising from non-random attrition. Another potential problem can also emerge from state dependence in period t relative to the eligibility status in period $t-1$. Cappellari and Jenkins (2008) point out that the eligibility of a household to receive a cash transfer could be associated with unobserved behavioural factors and actions that are related to previous eligibility experience. A single probit model would in that context be a naïve approach to modelling eligibility transitions. Thus, unobserved heterogeneity along with state dependence are simultaneously modelled to obtain consistent probability estimates in period t.

There are four simultaneous components of the modelling of the transition analysis that are taken into consideration. The first one is the estimation of the eligibility status in the period $t-1$, which will control for the state dependency of the eligibility status at t. The second one is the modelling of the probability that a household observed in period $t-1$ is retained in period t. The latter controls for unobserved heterogeneity that could drive the results. The third one is the estimation of the eligibility status in period t, providing the main input of analysis. Finally, the correlations of the first three components are observed in the assessment of how the state dependence and unobserved heterogeneity may affect the estimations of the transitions in the current period. All of these components depend on the availability of observable covariates in period $t-1$.

We follow Jenkins (2011) and consider the case that for $i = 1, \dots, N$ households, the propensity of being eligible to a SPP in period $t-1$ is given by:

$$p^*_{it-1} = \beta' X_{it-1} + u_{it-1} \text{ with } u_{it-1} = \mu_i + \delta_{it-1} \quad (1)$$

[11] See Jenkins (2011), Cappellari and Jenkins (2004) and Cappellari and Jenkins (2002)

where β' is a vector of parameters, X_{it-1} is a vector of explanatory variables or covariates at baseline, μ_i is a specific individual effect, and δ_{it-1}, an orthogonal white noise error. u_{it-1} is considered here to be random and normally distributed with expected value zero and variance equals 1. Eligibility status is defined when the propensity of being eligible to a SPP is greater than zero. Thus, if $p^*_{it-1} > 0$ then the expression $P_{it-1} = 1$ indicates a household eligible to a SPP.

We also assume that a household whose eligibility status is observed in $t-1$ is also observed in period t. To illustrate, consider r^*_{it} to be the propensity of retention of those households observed in both time periods, whose relation with the observed covariates is given by the following expression:

$$r^*_{it} = \psi' W_{it-1} + v_{it} \text{ with } v_{it} = \eta_i + \xi_{it} \quad (2)$$

where ψ' and W_{it-1} are the vectors of parameters and baseline covariates respectively; , η_i is a specific effect while ξ_{it} is the white noise error. v_{it} is assumed to be normally distributed with an expected value of 1 and a variance of zero. Similar to the previous case, a household is retained when $r^*_{it} > 0$ i.e. $R_{it} = 1$.

The propensity of being eligible is thus determined by:

$$p^*_{it} = [(P_{it-1})\gamma'_1 + (1 - P_{it-1})\gamma'_2]z_{it-1} + \varepsilon_{it} \text{ with } \varepsilon_{it} = \tau_i + \zeta_{it} \quad (3)$$

where γ'_1, γ'_2 and z_{it-1} are the vectors of parameters and baseline covariates, respectively; τ_i is the specific household effect and ζ_{it} a white noise normally distributed error. Similar to the eligibility status in the baseline period, if $p^*_{it} > 0$, $P_{it} = 1$ and then the household eligible, but if in only if $R_{it} = 1$.

The model of eligibility transitions also allows examining the correlations between the three aforementioned components of the model, which contributes to validate the simultaneous estimation of different propensities of being eligible. Note that u_{it-1}, v_{it} and ε_{it} in equations (1) and (2) and (3), respectively, are assumed to have a trivariate standard normal distribution. Therefore, the correlations are defined as:

$$\rho_1 \equiv corr(u_{it-1}, v_{it}) = cov(\mu_i, \eta_i) \quad (4)$$

$$\rho_2 \equiv corr(u_{it-1}, \varepsilon_{it}) = cov(\mu_i, \tau_i) \quad (5)$$

$$\rho_3 \equiv corr(v_{it-1}, \varepsilon_{it}) = cov(\eta_i, \tau_i) \quad (6)$$

The interpretation of equations (4), (5), and (6) is straightforward. ρ_1 indicates the relationship between initial eligibility status and the retention of the household in the survey. When $\rho_1 > 0$, household i is more likely to be observed eligible in period $t-1$, and exhibit a lower propensity to being attrited in period t. ρ_2 shows the extent of the association between the unobserved individual-level factors that determine eligibility in the baseline period, $t-1$, and the eligibility in t. If $\rho_2 > 0$, then the higher propensity of the household to be eligible in $t-1$ makes it more likely to remain eligible in period t. ρ_3 captures the correlation between the unobserved individual-level

effects in the propensity of retention with those determining current eligibility status. Similar to the previous inferences, if $\rho_3 > 0$, then the propensity of the household to be observed in both periods will positively drive the propensity of being (or become) eligible, vis-à-vis households with higher probabilities to attrit.

The validation of the model comes from the statistical significance of the correlations. If $\rho_1 = \rho_3 = 0$, then the retention of the households is not relevant and the attrition can be considered as exogenous. If $\rho_1 = \rho_2 = 0$, the eligibility status in the current period, t, is not endogenous to the eligibility status in the baseline period, $t-1$. Finally, if $\rho_1 = \rho_2 = \rho_3 = 0$, then the three equations are mutually exogenous, and therefore there is no need to estimate them simultaneously.

Of particular interest for the purpose of this paper is to estimate the *entry rate*, i.e. the predicted eligibility of programme eligibility probabilities in period t when a household is ineligible in period $t-1$. The predicted entry or eligibility persistence rate is defined as:

$$e_{it} = Pr(P_{it} = 1 | P_{it-1} = 1) = \frac{\phi_2(\gamma_1' z_{it-1}, \beta' X_{it-1}, \rho_2)}{\phi(\beta' X_{it-1})} \quad (7)$$

Similarly, an exit rate is defined by:

$$s_{it} = Pr(P_{it} = 1 | P_{it-1} = 0) = \frac{\phi_2(\gamma_1' z_{it-1}, -\beta' X_{it-1}, \rho_2)}{\phi(-\beta' X_{it-1})} \quad (8)$$

The quotient $1/s_{it}$ is also defined as the mean duration of the eligibility status and provides information on the period after which we expect an upwards mobility in the eligibility status. Non-eligible households are considered to be ready to leave the programme as they not comply with the eligibility criterion in period $t-1$, irrespectively to its particular entry likelihood in period *t*. The analysis of this paper focuses in particular on this prediction.

4.1. Estimation

The parameters in previous equations are estimated using Partial Likelihood Estimators. This is achieved for each household with eligibility status by the following log-likelihood equation:

$$\log L_i = P_{it-1} R_{it} log[\phi_3(k_i \gamma_1' z_{1t-1}, m_i \psi' w_{it-1}, q_i \beta' X_{it-1}; k_i m_i \rho_3, k_i q_i \rho_2; m_i q_i \rho_i)] + (1 - P_{it-1}) R_{it} log[\phi_3(k_i \gamma_2 z_{it-1}, m_i \psi' w_{it-1}, q_i \beta' X_{it-1}; k_i m_i \rho_3, k_i q_i \rho_2; m_i q_i \rho_2)] + (1 - R_{it}) log[\phi_2(m_i \psi' w_{it-1}, q_i \beta' X_{it-1}; m_i q_i \rho_i)] \quad (9)$$

where $k_i \equiv 2P_{it-1}$, $m_i \equiv 2R_{it-1}$, $q_i \equiv 2P_{it-1} - 1$

Note that equation (9) requires the availability of covariates in period $t-1$ and pooled socioeconomic information for each household in period t. Given the non-linearity of the log-likelihood function, and the potential complications that may arise from the trivariate normal distribution function in ϕ_3, Cappellari and Jenkins (2004) suggest to estimate the parameters by simulation using a certain number of draws, following Gourieroux and Monfort (1996).

5. Data

We use the Mexican Family Life Survey (MxFLS), which is a multi-thematic longitudinal database collecting a wide range of information on socioeconomic indicators, demographics and health indicators on the Mexican population. The survey was implemented as a joint effort between the National Council of Science and Technology, the Iberoamercana University, the *Centro de Investigacion y Docencia Economica* (CIDE) and the National Institute of Statistics and Informatics (INEGI). The National Institute of Public Health and the University of California at Los Angeles (UCLA) were also involved. The baseline (MxFLS-I) was collected in 2002, and a second wave (MxFLS-II) was conducted during 2005-2006 with 88.5 percent re-contacting rate; and a third round (MxFLS-III) between 2009-2012 with a re-contacting rate of 83.5 percent.[12] All of rounds are freely available at the project's webpage.[13]

The MxFLS follows a probabilistic, stratified, multi-staged, and independent sample intended to be nationally representative of the rural and urban Mexican population. According to Rubalcava and Teruel (2004), the sampling frame involved both random selection of localities in the 32 Mexican states, and random selection of households within the localities. The intended sample size was set for both rounds at 8 thousand households and 35 thousand individuals with an oversampling that considered a retention rate of 90 percent. The survey was collected in each round between the months of April and July. The questionnaire is integrated by ten modules that include information on household profiles, consumption expenditure, income, intra-household dynamics and cognitive skills

6.1. Income calculation

Since we focus on current eligibility to the programme, we calculate the household disposable income following INEGI's methodology (INEGI, 2013). The calculation of household disposable income, upon which official figures on poverty and inequality rely, is composed of four relevant sources. First, earnings from labour activities including wages, gifts, profits, severance payments and in-kind goods paid for work and earnings from self-employment. Second, rents from properties financial assets, and the ownership of intellectual property and the profits from firms owned by household members. Third, transfers from private or public sources. These include pensions, cash and in-kind transfers from friends, relatives, donations, charity or state programmes. Finally, income from housing rents. Each house-owner household is asked about how much they would pay if they rented the house they occupy. The estimated value of the house rent is added to the current income, since it is considered that house-owners dispose of the income not spent on rent.

Several challenges emerged when calculating income with the MxFLS. In the MxFLS-I the questions on the value of rental costs were not included in the questionnaire. This generated an information gap for those households owning their house, whose income would be incorrectly calculated unless an additional imputation is considered. To address this limitation, we adopted the following steps: first, we compared the information in MxFLS-I with that of the MxFLS-II to identify those households that still lived in the same own house. We found that 97 percent of unattrited households surveyed in MxFLS-I were still living in the same own house in MxFLS-II. Second, we used the declared rental value in MxFLS-II to retrieve it back to MxFLS-I. Finally, we

[12] A third one was collected in 2009 but to date it is not of public domain.
[13] http://www.ennvih-mxfls.org/

use the housing component of the consumer price index generated by INEGI to deflate rental values to 2002 prices.

In addition, while households' participation in *Oportunidades* was explicit reported in the MxFLS-I, it was not in the MxFLS-II. The programme experienced an important increase in coverage between 2002 and 2005. The MxFLS-II collected information on *Oportunidades* participation; however, the answer was not included in the dataset available on the MxFLS's webpage. For that reason, we decided not to consider income sources from the programme when calculating household income.

Recall that the eligibility of a household to participate in *Oportunidades* relies on a predicted income below the MWL with households with income above the CL being graduated from the programme. Households with income below the CL stay in the programme if they have members aged less than 22 years and/or women between 15-49 years of age. Given that a household's eligibility transition could entail some members turning older than 22 or 49 years of age, we include in our analysis those households with members under 15 and 42 years of age in 2002. This allows us to focus on households' eligibility transitions using the CL as the only cut-off that determines (or not) participation.

In MxFLS-I, the CL was set at 987.72 and 1,027.35 Mexican pesos for urban and rural areas respectively. For MxFLS-II and MxFLS-III the poverty lines were indexed according to the consumer price index. Table 1 below displays the mean income and proportion of households below the CL. It indicates that 37.4, 30.2 and 32.2 percent of Mexican households were identified with income below the CL in MxFLS-I, MxFLS-II and MxFLS-III, respectively. The proportion is higher in rural areas, however, instead of worsening the percentages slightly improved in the observed period. Contrary, in urban areas the percentages increased between the last two rounds.

Table 1: Average income and proportion of households below the PSCVL

Survey round	MxFLS-I	MxFLS-II	MxFLS-III
Average per capita income	5,040	5,843	6,836
Proportion below CL	0.374	0.302	0.322
Average per capita income - Urban	6,158	7,015	8,046
Proportion below CL - Urban	0.296	0.221	0.245
Average per capita income - Rural	3,275	3,945	4,561
Proportion below CL - Rural	0.496	0.433	0.423

Source: Mexican Family Life Survey-I, II and III.
Note: Values in Mexican pesos at current prices for each year.

6.2. Covariates

Table A1 in the Appendix presents the selected covariates used to predict the transition probabilities. It indicates that households live predominantly in houses with firm cement floor and hard walls materials. Rural areas exhibit a low coverage latrine use as type of toilet, while access to electricity is almost universal, particularly in urban areas. As expected, physical attributes show lower standards of living among eligible vis-à-vis ineligible households.

Covariates on household composition include information on age and years of education of the household head and spouse, along with the mean household age, education and number of children. The dependency ratio denotes higher dependency in rural areas. Information about the presence of pregnant woman, members with chronic illness and whether children attended school was included. Information on assets such as vehicles, appliances and livestock, and idiosyncratic shocks was also included in the estimations.

6. Results

We turn our attention to the transition matrices of household eligibility between MxFLS-I and MxFLS-II and MxFLS-I and MxFLS-III. As pointed out earlier, programme eligibility is determined by the PSCVL income threshold. The transition matrices also consider the sample with unattrited and attrited households.

Table 2 presents the results. Starting from urban areas and using the unattrited sample, it is observed that 17.7 and 22.4 percent of ineligible households in MxFLS-I became eligible in MxFLS-II and MxFLS-III. The results also indicate that 67.2 and 67.1 percent of urban eligible households in MxFLS-I became ineligible in MxFLS-II and MxFLS-III, respectively, using the unattrited sample.

Interestingly, the rural transition matrices show higher eligibility dynamics. In fact: 32.2 and 35.5 percent of ineligible households became eligible in MxFLS-II and MxFLS-III, respectively. The proportion of rural eligible households that became ineligible was lower than the one observed in urban areas, with 57.2 and 58.7 percent using the unattrited and attrited samples, respectively.

[Continued in the next page]

Table 2: Transition matrix.

Eligibility defined by CL		Eligibility at *t (MxFLS-I to MxFLS-II)*			Eligibility at *t (MxFLS-I to MxFLS-III)*		
	Sample with unattrited sample	Ineligible	Eligible	Missing	Ineligible	Eligible	Missing
Eligibility at *t-1 (urban)*	Ineligible	82.3%	17.7%		77.6%	22.4%	
	Eligible	67.2%	32.8%		67.1%	32.9%	
	All	78.2%	21.8%		74.6%	25.4%	
	Sample with attrited sample						
	Ineligible	72.1%	15.5%	12.5%	59.5%	17.2%	23.3%
	Eligible	52.0%	25.5%	22.5%	48.4%	23.7%	28.0%
	All	66.1%	18.4%	15.4%	56.2%	19.1%	24.7%
	Sample with unattrited sample	Ineligible	Eligible	Missing	Ineligible	Eligible	Missing
Eligibility at *t-1 (rural)*	Ineligible	67.8%	32.2%		64.5%	35.5%	
	Eligible	46.4%	53.6%		52.9%	47.1%	
	All	57.2%	42.8%		58.7%	41.3%	
	Sample with attrited sample						
	Ineligible	64.6%	30.6%	4.9%	56.4%	31.1%	12.5%
	Eligible	43.9%	50.7%	5.4%	47.1%	42.0%	10.9%
	All	54.3%	40.6%	5.1%	51.8%	36.5%	11.7%

Source: Mexican Family Life Survey-I,II and III.

[Continued in the next page]

Similarly, Table 3 below also presents the poverty or eligibility dynamics following the analytical framework previously described. In this sense, 52 and 41.6 percent of households were identified as never poor or eligible in urban and rural areas, respectively. On the other hand 12.5 and 11.7 percent of the households were identified as always poor or eligible to stay in the programme in urban and rural areas, respectively. This confirms that higher dynamics are observed in rural areas, as 46.7 percent households were found to manifest varying poverty or eligibility status. In fact, rural areas have higher descending and usually poor households.

Table 3. Eligibility dynamics according to MxFLS rounds.

Dynamics	MxFLS-I	MxFLS-II	MxFLS-III	Urban households	Rural households
Never poor/eligible	Ineligible	Ineligible	Ineligible	52.0%	41.6%
Descending household	Ineligible	Eligible	Eligible	2.3%	5.0%
Occasionally poor/eligible	Ineligible	Eligible	Ineligible	7.3%	10.0%
Occasionally/descending	Ineligible	Ineligible	Eligible	9.6%	10.7%
Always poor/eligible	Eligible	Eligible	Eligible	12.5%	11.7%
Escapee household	Eligible	Ineligible	Ineligible	10.7%	11.6%
Usually poor/eligible	Eligible	Ineligible	Eligible	3.1%	4.2%
Usually/escapee	Eligible	Eligible	Ineligible	2.6%	5.3%

Source: Mexican Family Life Survey-I,II and III.

6.1. Estimation of transition probabilities

We turn now to the results obtain from the estimation of the predicted transition probabilities derived from equation (9). The multivariate probit has been estimated by running a simulation with 300 draws in urban and rural areas. We regress the covariates on the eligibility status in $t-1$ and t, and on the retention status based on the observed household characteristics. Starting from the model specification, Table 4 presents the results of the correlations and hypothesis tests after estimating equations (4), (5) and (6).

Overall, the correlation between initial eligibility status and unobserved characteristics, which drives attrition, ρ_1, is small, negative in urban areas but not statistically significant in rural and urban areas, which indicates that being eligible in MxFLS-I is not necessarily correlated with being unattrited in MxFLS-II and MxFLS-III. The correlation between unobserved characteristics and being simultaneously eligible in MxFLS-I and the next two rounds, ρ_2, is positive and statistically significant, indicating that we cannot reject that being eligible in MxFLS-I makes more likely to remain eligible in MxFLS-II and MxFLS-III. The correlation between unobserved characteristics affecting attrition and current eligibility status, ρ_3, is positive and statistically significant, indicating that ineligible households in t are more likely to attrit.

From the bottom end of Table 4 the results show that the joint correlations are different from zero, indicating that the assumption of joint exogeneity cannot be rejected and hence the model is correctly specified.

Table 4: Model specification tests of hypothesis.

Eligibility defined by CL	Rural		Urban	
Correlations between unobservables	*Estimate*	*t-statistic*	*Estimate*	*t-statistic*
Base-round eligibility status and retention (ρ_1)	-0.015	-0.27	0.000	0.01
Base-round eligibility status and conditional current eligibility status (ρ_2)	0.053	2.21	0.116	2.31
Retention and conditional current eligibility status (ρ_3)	0.943	23.78	0.899	24.99
Tests of hypotheses	*Test statistic*	*p-value*	*Test statistic*	*p-value*
Exogeneity of initial conditions, $\rho_1 = \rho_2 = 0$	-0.27	0.791	0.01	0.989
Exogeneity of sample retention, $\rho_1 = \rho_3 = 0$	1.21	0.227	2.29	0.022
Joint exogeneity, $\rho_1 = \rho_3 = \rho_3 = 0$	4.93	0.000	379.88	0.000

Source: Mexican Family Life Survey-I,II and III.

Table A2 in the Appendix presents the results from the estimation of the predicted transition probabilities. A limited number of covariates turned out to be significant in rural areas. In fact, with the exception of wall material, none of the coefficients of the physical characteristics (generally time-invariant) were different from zero. Average years of education of the household, children school attendance and having financial assets were associated with a reduced probability of becoming eligible; whereas higher numbers of young children and loss of a crop were associated with a higher probability of becoming eligible.

Conversely, urban households with townhouses, concrete wall material, tap water, owning their house, garbage collection, head's age, and male head being were found less likely to become eligible. Urban households with higher crowding rates, dependency ratio, and a loss of a crop were more likely to become eligible.

The predicted transition probabilities allow for the calculation of the entry and exit rates. We define a critical threshold in the entry rates of 0.5, over which a household is more likely to become or remain eligible and we expect them to be always poor, while exit rates with values greater than 0.5 translated into a high probability of dropping the programme or escapee. Overlapping between entry rates is possible as any household can manifest different probabilities for both.

Table 4 shows the results of the predicted entry and exit rates. In urban areas, we find that that 38 percent of the population is likely to remain or become eligible to receive *Oportunidades*, while 33.2 percent is more likely to become or remain ineligible. Relevant to our analysis, and when focusing on ineligible households in the baseline, we find that 34 percent of these households are likely to become eligible. This is an important finding: *Oportunidades* administrators may graduate households because their earnings cross the CL threshold, in spite of exhibiting a high propensity to become eligible again in the near future.

It was found that 26.7 percent of urban ineligible households could be graduated while experiencing a low probability of becoming programme eligible again. In rural areas entry rates are higher than in urban areas, while the exit rates are roughly similar in both contexts.

Table 5: Predicted entry and exit rates.

Eligibility defined by CL	Population	Ineligible in 2009
Urban		
Entry rate > 0.5	38.0%	34.0%
Exit rate > 0.5	33.2%	28.9%
Rural		
Entry rate > 0.5	47.4%	44.8%
Exit rate > 0.5	22.2%	26.7%

Source: Mexican Family Life Survey-I, II and III.
Note: (1) Entry and exit rates calculated by predicted transition probabilities

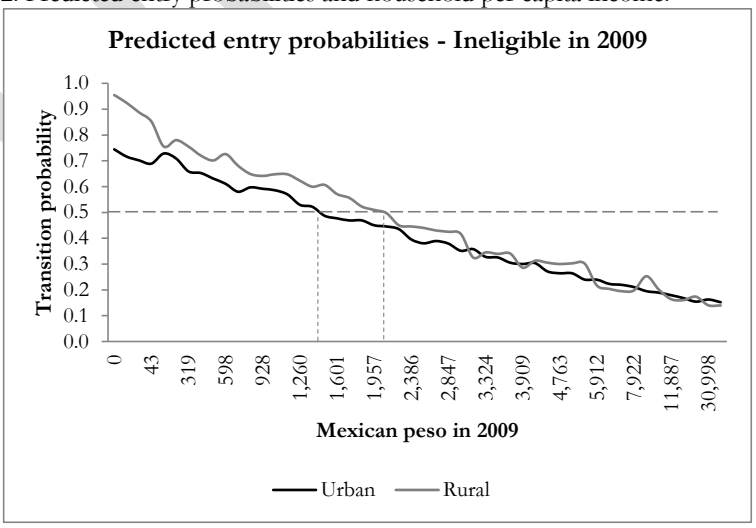
Finally, the predicted exit rates can be used to calculate the expected duration of an average eligibility experience. This information is relevant for the implementation of the programme, as currently a reclassification of beneficiaries is intended to be conducted every three years. Our results indicate that urban households experience an expected eligibility duration of 3.5 years. Similarly, the average eligibility duration in rural areas is estimated in 4.1 years.

6.2. Proposed graduation line

Based on the predicted entry rates, we propose a graduation line that determines the graduation from the programme at low transition probabilities of being classified eligible. This is done by comparing the predicted entry probabilities and the observed household income. We then identify the income line above which the probability of being eligible is below the 0.5 threshold in urban and rural areas. The programme could be phased out after the predicted household income is above this line and transfers can be stopped considering these poverty dynamics.

Figure 2 below shows how entry probabilities decline with higher levels of observed income in 2009:

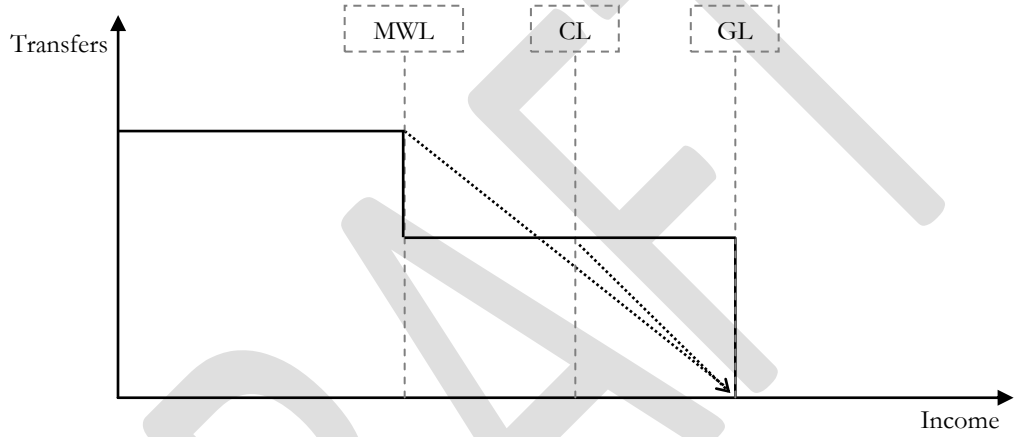
Figure 2. Predicted entry probabilities and household per capita income.



Source: MxFLS-I, II and III.

According to this analysis the graduation line (GL) for *Oportunidades* could be set at 2,086 and 1,511 Mexican peos in urban and rural areas, respectively. However, an important concern that arises from this proposal is whether transfers should be stopped abruptly or gradually. Figure 3 below illustrates current transfer setting, starting from the full entitlements when a given household earns income below the MWL. Between the MWL and the GL the transfers are reduced and beyond that the transfer are abruptly stopped. A first option could be to keep the reduced transfers up to the GL and then abruptly phase out the transfers. The second option entails a gradual decline with a constant slope either from the MWL or the CL.[14] The decision whether a SPP should opt for an abrupt or gradual phase out of the transfers is beyond the scope of this paper.

Figure 3. Transfers level and income.



7. Conclusions

This paper has provided an analysis of the implications of eligibility dynamics (as a consequence of poverty dynamics) in the context of the implementation of Mexico's *Oportunidades* programme. Programme eligibility is not static over time. In an ideal scenario, eligible households would transit to an ineligible status after receiving programme treatment for a given period. This is known as programme graduation. To date, most transfer programmes respond to upward income transitions by dropping beneficiaries with no major consideration on the socioeconomic dynamics that may follow.

Our results suggest that eligibility just about one-third of ineligible households can be considered true graduates as they show low probabilities of becoming eligible in the future. Our results also

[14] Gradual phasing out of the transfers are adopted by tax credit schemes in some OECD countries such as United Kingdom and United States. The slope of the declining line has been based on the labour incentives that may arise from the absence of the transfer (Saez, 2002). However, SPP need to evaluate other outcomes such as child human capital formation and household resilience to economic shocks.

suggest that the recertification process of *Oportunidades*–which, takes place every three years–could be optimised by take place every 3.5 and 4.1 years in urban and rural areas, respectively.

An important conclusion arising from the analysis relates to the practice of graduating programme beneficiaries when they cross the income threshold that separates the poor from the non-poor in a static fashion. Our results suggest that graduation should take place when a sustained eligibility exit trend is observed. Our analysis does not provide answers about the type of policy strategies that may help beneficiaries to find a permanent way out of eligibility. Instead, we highlight the relevant conditions that *Oportunidades* could consider before graduating programme participants. In particular, our study highlights the strong influence that eligibility dynamics have on programme eligibility. Graduation under such contexts could be granted when the probability of ineligible households to become eligible is low. Clearly, our findings are strictly dependent on how frequent the eligibility status of programme beneficiaries is evaluated. More research is needed to shed light into the conditions that may facilitate permanent graduation as well as the optimal length of eligibility assessment given the high costs that this type of assessments entail.

To our knowledge, this paper is the first study that analyses programme graduation from an eligibility dynamic framework. The estimation method is consistent with the empirical considerations of unobserved heterogeneity, state dependence and attrition that are likely to bias similar analysis under more conventional approaches of vulnerability to poverty or eligibility.

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Appendix

Table A1: Descriptive statistics

Covariates	Rural				Urban			
	Eligible (mean)	Eligible (SD)	Ineligible (mean)	Ineligible (SD)	Eligible (mean)	Eligible (SD)	Ineligible (mean)	Ineligible (SD)
Physical characteristics								
Type of dwelling								
Sole house/does not share walls	0.787	(0.410)	0.798	(0.402)	0.682	(0.466)	0.672	(0.470)
Floor material								
Firm cement	0.534	(0.499)	0.613	(0.487)	0.663	(0.473)	0.437	(0.496)
Walls material								
Concrete, partition, brick, block	0.632	(0.483)	0.644	(0.479)	0.881	(0.324)	0.916	(0.277)
Roof material								
Concrete/partition/brick/block	0.365	(0.482)	0.441	(0.497)	0.663	(0.473)	0.692	(0.462)
Source of drinking water								
Tap water inside the dwelling	0.543	(0.498)	0.480	(0.500)	0.319	(0.466)	0.306	(0.461)
Type of toilet								
Latrine	0.399	(0.490)	0.361	(0.481)	0.078	(0.268)	0.062	(0.240)
House has electricity	0.967	(0.180)	0.978	(0.147)	0.991	(0.094)	0.994	(0.075)
Telephone landline	0.143	(0.350)	0.200	(0.400)	0.415	(0.493)	0.492	(0.500)
Own paid house	0.595	(0.491)	0.627	(0.484)	0.502	(0.500)	0.637	(0.481)
Sewage service	0.216	(0.412)	0.222	(0.416)	0.779	(0.415)	0.790	(0.408)
Garbage collection service	0.336	(0.473)	0.428	(0.495)	0.888	(0.316)	0.902	(0.297)
House surrounded by residues	0.058	(0.234)	0.039	(0.192)	0.023	(0.150)	0.020	(0.140)
Persons per bedrooms	3.510	(1.841)	2.945	(1.519)	2.809	(1.342)	2.520	(1.248)
Household Head								
Age	43.40	(14.028)	44.964	(13.563)	39.882	(11.242)	42.290	(12.481)
Male = 1	0.795	(0.404)	0.850	(0.357)	0.835	(0.371)	0.816	(0.388)

Years of education	4.381	(3.486)	4.569	(3.629)	5.871	(4.004)	5.803	(4.061)
Spouse age	30.31	(19.115)	33.051	(18.649)	29.773	(16.513)	30.604	(18.041)
Spouse years of education	3.551	(3.453)	3.926	(3.618)	5.277	(4.181)	5.069	(4.294)
Other household members								
Mean household age	22.97	(8.464)	24.704	(8.261)	22.496	(7.073)	24.648	(7.861)
Mean household years of education	3.857	(1.815)	4.349	(1.961)	4.763	(2.110)	4.991	(2.152)
Max. years of edu. of household members	7.706	(2.637)	8.356	(2.748)	8.967	(2.801)	9.233	(2.842)
Number of children under 6 yo	0.992	(1.005)	0.809	(0.902)	0.872	(0.883)	0.708	(0.821)
Number of children under 15 yo	2.648	(1.643)	2.253	(1.488)	2.180	(1.312)	1.853	(1.194)
Mean children age	5.245	(4.069)	5.724	(4.359)	5.332	(4.171)	5.734	(4.454)
Dependency ratio*	2.303	(1.137)	2.030	(0.936)	2.050	(0.867)	1.840	(0.723)
Pregnant in the household	0.050	(0.219)	0.049	(0.216)	0.031	(0.172)	0.044	(0.205)
Member with chronic illness	0.381	(0.486)	0.470	(0.499)	0.310	(0.463)	0.458	(0.498)
Children attend school	0.760	(0.428)	0.745	(0.436)	0.575	(0.495)	0.659	(0.474)
Assets								
Household owns other house	0.176	(0.381)	0.228	(0.419)	0.068	(0.252)	0.138	(0.345)
Bicycle	0.242	(0.429)	0.389	(0.488)	0.158	(0.365)	0.405	(0.491)
Vehicle	0.114	(0.318)	0.275	(0.446)	0.112	(0.316)	0.321	(0.467)
Electric appliances	0.447	(0.498)	0.711	(0.453)	0.328	(0.470)	0.683	(0.465)
Washing machine	0.394	(0.489)	0.668	(0.471)	0.326	(0.469)	0.674	(0.469)
Financial assets	0.035	(0.184)	0.071	(0.257)	0.054	(0.225)	0.184	(0.388)
Agricultural machinery	0.009	(0.095)	0.036	(0.187)	0.005	(0.071)	0.028	(0.164)
Cows	0.052	(0.222)	0.088	(0.284)	0.003	(0.051)	0.020	(0.140)
Horses	0.104	(0.305)	0.123	(0.329)	0.010	(0.101)	0.016	(0.125)
Pigs or goats	0.085	(0.279)	0.151	(0.358)	0.013	(0.112)	0.026	(0.158)
Poultry	0.157	(0.364)	0.256	(0.437)	0.037	(0.189)	0.055	(0.227)
Shocks in the last five years								
Household member died	0.067	(0.250)	0.098	(0.297)	0.067	(0.250)	0.086	(0.281)

Household member suffered accident	0.103	(0.305)	0.131	(0.337)	0.117	(0.322)	0.143	(0.350)
Household member lost employment	0.052	(0.223)	0.061	(0.238)	0.115	(0.320)	0.106	(0.308)
Household was victim of natural disaster	0.013	(0.112)	0.027	(0.162)	0.009	(0.096)	0.007	(0.082)
Household lost a crop	0.086	(0.280)	0.112	(0.315)	0.008	(0.088)	0.015	(0.121)
Number of observations (households)	766,636		3,210,797		2,468,321		10,809,191	

Source: Mexican Family Life Survey (MFLS-1). Note: * Dependence ratio defined as the number of members under 14 years old and over 65 years old divided by the numbers of members between 15-64 years old. (1) Eligibility according to PSCVL; (2) Weighted number of observations.

Table A2: Transition probabilities estimation

Dep. variable: Below CL = 1	Rural	Urban
Physical characteristics		
Type of dwelling		
Sole House sharing walls	0.073	-0.148***
	(0.056)	(0.045)
Floor material		
Firm cement	-0.067	0.080
	(0.061)	(0.062)
Walls material		
Concrete, partition, brick, block	-0.177**	-0.241**
	(0.088)	(0.121)
Roof material		
Concrete/partition/brick/block	-0.020	0.008
	(0.067)	(0.071)
Source of drinking water		
Tap water inside the dwelling	0.005	-0.136***
	(0.034)	(0.046)
Type of toilet		
Latrine	0.029	-0.042
	(0.044)	(0.105)
House has electricity	-0.062	0.075
	(0.168)	(0.306)
Telephone landline	-0.099	-0.062
	(0.087)	(0.068)
Own paid house	0.084	-0.142**
	(0.052)	(0.060)
Sewage service	-0.007	-0.098
	(0.056)	(0.094)
Garbage collection service	-0.065	-0.192*
	(0.058)	(0.104)
House surrounded by residues	0.172	0.003
	(0.174)	(0.179)
Persons per bedrooms	0.038	0.057***
	(0.028)	(0.016)
Household Head		
Age	0.000	-0.009***
	(0.002)	(0.003)
Male = 1	-0.059	-0.179**
	(0.116)	(0.089)

Years of education	-0.022**	0.007
	(0.010)	(0.008)
Spouse age	0.000	0.002
	(0.002)	(0.002)
Spouse years of education	-0.015	0.004
	(0.013)	(0.011)
Other household members		
Mean household age	-0.009*	-0.008
	(0.005)	(0.005)
Mean household years of education	-0.001	0.007
	(0.032)	(0.025)
Max. years of edu. of household members	-0.027**	-0.016
	(0.013)	(0.011)
Number of children under 6 yo	0.131***	0.092*
	(0.042)	(0.053)
Number of children under 15 yo	0.056**	0.062
	(0.027)	(0.041)
Mean children age	-0.008	0.005
	(0.006)	(0.005)
Dependency ratio*	-0.003	0.112**
	(0.021)	(0.046)
Pregnant in the household	0.188	0.074
	(0.127)	(0.057)
Member with chronic illness	0.069	-0.056
	(0.051)	(0.062)
Children attend school	-0.122*	-0.002
	(0.072)	(0.078)
Assets		
Household owns other house	-0.007	0.003
	(0.091)	(0.059)
Bicycle	-0.079	0.087
	(0.061)	(0.071)
Vehicle	0.001	0.001
	(0.047)	(0.076)
Electric appliances	-0.118	-0.250
	(0.116)	(0.201)
Washing machine	0.008	0.178
	(0.110)	(0.241)
Financial assets	-0.356***	-0.068
	(0.132)	(0.076)
Agricultural machinery	0.217	-0.167

	(0.142)	(0.147)
Cows	-0.011	-0.147
	(0.070)	(0.213)
Horses	0.085	0.379
	(0.091)	(0.250)
Pigs or goats	-0.044	-0.011
	(0.066)	(0.165)
Poultry	0.113	0.018
	(0.075)	(0.115)
Shocks in the last five years		
Household member died	-0.034	-0.123
	(0.074)	(0.085)
Household member suffered accident	0.054	0.075
	(0.075)	(0.060)
Household member lost employment	-0.073	-0.093
	(0.094)	(0.089)
Household was victim of natural disaster	-0.249	-0.037
	(0.235)	(0.248)
Household lost a crop	0.231**	0.290**
	(0.101)	(0.145)
Number of observations (households)	3,977,433	13,277,512

Source: Mexican Family Life Survey-I,II and III.
Notes: (1) Robust standard errors in parentheses. (2) Estimations from a multivariate Probit model by simulation with 300 draws (3) State-level fixed effects and outputs for the baseline and retention estimations are not reported. (4) Inference: *** significant at 1%; ** significant at 5%; significant at 10%.