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Poverty dynamics and programme graduation from social protection

A transitional model for Mexico's *Oportunidades* programme

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Abstract: Social protection programmes have emerged as one of the most important anti-poverty policy strategies in developing countries. Their effects on poverty and well-being have been widely studied. Yet, there is limited knowledge on how a transfer programme should respond to the dynamics of poverty. This paper contributes to the existing literature on social protection by providing an analysis of the implications of poverty dynamics for the graduation of beneficiaries of Mexico's *Oportunidades* programme. To the best of our knowledge, this is the first study that provides a framework for a generic graduation condition, to the extent that it can be applied to any other transfer programme with means tests or proxy-means tests. By estimating a Markovian transition model that accounts for unobserved heterogeneity, state dependence, and attrition, and using three rounds of the longitudinal Mexican Family Life Survey, we find that *Oportunidades* could 'graduate' only 28.9 and 26.7 per cent of beneficiary households in urban and rural areas, respectively. Our results also show that the 'recertification' or eligibility assessment of *Oportunidades*—which takes place every three years—could be optimized by conducting it 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*
JEL classification: I32, I38, C23

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1 Introduction

Within anti-poverty strategies, governments in developing countries have increasingly implemented social protection programmes (SPPs). In the particular case of human development conditional cash transfers in Latin America, it is estimated that about 215 million people have received the benefits of such interventions since the mid-1990s (Niño-Zarazúa 2011). In Mexico, Brazil, and Colombia, some of the pioneer countries that introduced transfer programmes to scale in the region, the exposure of some beneficiaries to conditional cash transfers 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 are therefore eligible to receive benefits.

Programme eligibility is relevant in situations where there are active policy responses to conditions of extreme deprivation. In the context of the implementation of SPPs, poverty and eligibility can be treated as equivalent concepts.[1] In the long-term, beneficiary households, particularly those closer to the poverty line, are likely to experience poverty and non-poverty spells that would switch their status from eligible to ineligible to receive the programme entitlements and vice versa.

To date, there has been little recognition of the poverty dynamics in the implementation of transfer programmes. How should an SPP respond when a beneficiary becomes non-poor or ineligible in time t-1, and falls back into poverty or eligibility in time t ? This is a relevant, yet unanswered question. 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 and have become no longer eligible to receive programme benefits. Mexico's *Oportunidades* programme, for instance, undertakes eligibility assessments or 'recertification' of the socioeconomic status of beneficiaries every three years. When a household crosses the poverty line, the programme administrators either drop the household from the programme altogether or reduce the level of benefits according to the household's predicted disposable income.[2] Ideally, programme graduation should consider the non-recurrence of poverty leaving beneficiaries (Munro 2008). The problem with the conventional graduation approach is that it ignores the possibility of ineligible households exhibiting non-positive trajectories in their socioeconomic mobility. These households, therefore, might be at the risk of becoming poor and, consequently, eligible in the future.

Poverty persistence and its dynamics can also be associated with negative incentives arising from the exposure to social protection. The literature on poverty dynamics and welfare regimes highlights that households with past exposure to transfer programmes are more likely to participate in the programmes in the future (Andrén 2007). One explanation is what Sen (1995) calls 'incentive distortion' in which households change their behaviour in order to keep their eligibility status.[3] In the context of the implementation of SPPs, Cappellari and Jenkins (2008) refer to this

[1] The relationship between poverty and eligibility is straightforward. Poverty status determines eligibility to receive benefits from transfer programmes. This relationship becomes relevant when SPPs target the poor through 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. This is because programmes can incur inclusion and exclusion errors. If these errors were marginal and constant over time, poverty and eligibility dynamics would follow similar trends.

[2] When households are classified as ineligible to receive transfers, programme administrators either grant a differentiated benefit or stop the transfers. A recent study by González-Flores et al. (2012) on Mexico's *Oportunidades* programme examined the upward mobility of current participants in order to determine which household characteristics make them be classified as ineligible.

[3] Kanbur et al. (1994) have explored the implications of labour incentives to programme eligibility.

phenomenon as 'state dependence', in the sense that a household's current eligibility may be dependent on previous eligibility experience. Therefore, the discussion on graduation from SPPs should not be limited to the ineligibility status of current beneficiaries. As transfer programmes distribute cash to those in poverty, this paper estimates the likelihood of current ineligible households falling into poverty and becoming eligible to programme benefits, and assesses the implications of such dynamics for policy and future practice. Programme graduation becomes an actual fact only when non-poor households exhibit low probabilities of future poverty spells and, thus, of becoming eligible to programme entitlements.

The issue of poverty and consequent eligibility dynamics have been examined using various analytical frameworks gravitating round the estimation of vulnerability to poverty, expected utility, or uninsured risk, with very few agreements 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, eligibility dynamics is assessed by the poverty spells and the eligibility transitions observed in the context of Mexico's *Oportunidades* programme.

Using the Mexican Family Life Survey (MxFLS), this paper focuses on those households that were identified as non-poor or ineligible to programme benefits in the baseline (MxFLS-I) but were then classified as eligible in follow-up surveys (MxFLS-II and MxFLS-III). We estimate a Markovian model of multivariate normal probabilities following Cappellari and Jenkins (2004, 2008) and Jenkins (2011). The model allows for the estimation of eligibility dynamics while accounting for three important factors: (i) unobserved heterogeneity that can lead to bias estimators; (ii) the possibility of selection bias associated with behavioural decisions that can lead to state dependence; and (iii) potential bias arising from panel attrition.

This paper contributes to existing literature on social protection in several ways. It examines the implications of poverty dynamics for the graduation of beneficiaries from conditional cash transfer programmes. To the best of our knowledge, this is the first study that provides a framework for a generic graduation condition, to the extent that it can be applied to any transfer programme with means tests or proxy-means tests. It also provides an empirical analysis of Mexico's *Oportunidades* (previously known as *Progresa*), which is the flagship anti-poverty SPP in the country, and is a general reference for the replicability of similar strategies in other countries (Barrientos and Villa 2013; Niño-Zarazúa 2011). Several design features of *Oportunidades* have been subject to 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 remainder of this 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 the *Oportunidades* programme; Section 4 presents the methodology, Section 5 describes the MxFLS used in the empirical analysis; Section 6 presents the results of the study; and Section 7 concludes with reflections on policy.

2 Poverty and eligibility dynamics

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

Poverty dynamics in such situations can affect eligibility to programme benefits. Over time, the poor can be broadly divided into two aggregate groups: *chronic poor* and *transient poor*.[4] 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. Well-being improvements tend to occur gradually, whereas declines tend to emerge abruptly. The usually poor tend to fluctuate sporadically under and above the poverty line;[5] therefore, they can be regarded as ineligible to receive a transfer programme for a short period throughout the course of life. Similarly, the transient poor are those who escape poverty but can fall into poverty or eligibility thresholds; they can be divided into *churning poor* and *occasionally poor*. The churning poor fluctuate below and above the poverty line in a seasonal pattern, especially in rural areas where households are reliant on seasonal food production (Dercon and Krishnan 2000). The occasionally poor, for most of the time, tend to be above the poverty line but can experience a poverty spell at least once throughout the course of life (Hulme and Shepherd 2003).

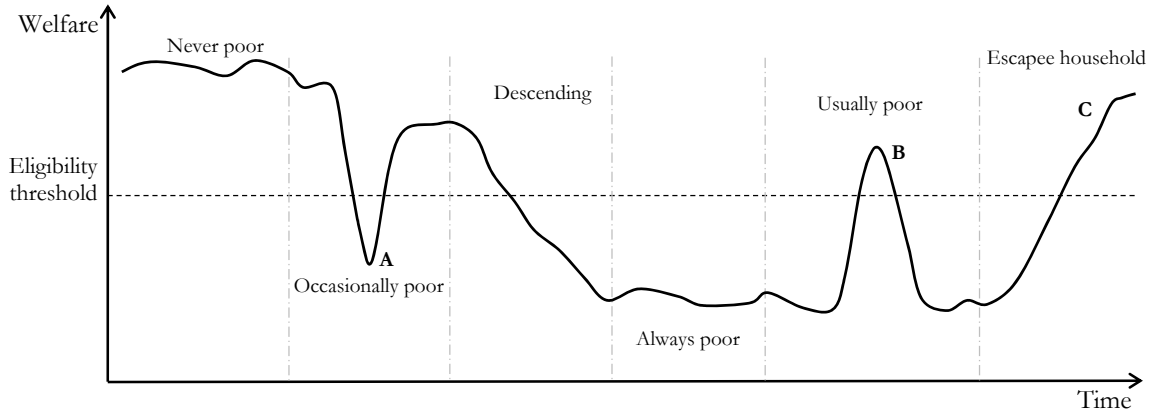
Figure 1 illustrates eligibility dynamics and their implications for the implementation of SPPs. The vertical axis is divided by the eligibility threshold that separates poor households or individuals from the non-poor. The horizontal axis represents the time line (dashed) with hypothetical milestones according to the observed patterns of household welfare. The solid line indicates the welfare level of a household initially classified as never poor that falls below the eligibility threshold later on. Occasionally poor households experience transient poverty at point A, and become eligible to a cash transfer programme for a given period. In contrast, descending households might experience a negative shock that pushes them below the eligibility threshold, as they are vulnerable to poverty at a critical point.[6] Always poor households are persistently under the eligibility threshold, with constant eligibility to any targeted intervention. Usually poor households are persistently poor in the long run, but they can experience temporary non-poverty spells. A programme could stop the transfer to usually poor households at point B, ignoring that they will be eligible for the intervention in the future. SPPs would incur prospective exclusion errors if usually poor households were dropped. Thus, an ideal graduation rule would lead the implementation of a transfer programme to identify 'escapee' households who become non-poor in the medium-term, after crossing point C.

[4] Jalan and Ravallion (2000) regard transient poverty as the varying component of consumption that can be mitigated by insurances or income stabilization 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.

[5] This is also known as a saw-tooth trajectory (Davis 2009).

[6] Baulch (2011) examines the causes of a household falling into chronic poverty. He identifies among the causes the lack of resilience to negative shocks (idiosyncratic or covariant), especially when the affected household is endowed with low levels of physical, natural, human, financial, or social capital.

Figure 1: Eligibility dynamics



Source: Authors' estimates.

Central to this analysis is the fact that transfer programmes often deal with the usually and occasionally poor households that experience poverty and non-poverty spells. If the well-being conditions of the usually poor are assessed at point B (Figure 1), administrators could mistakenly decide to stop the transfers to a given non-poor ineligible household, even if it is at the risk of becoming eligible immediately afterwards. The assessment of household welfare and the determinants of poverty transition probabilities can provide social transfer programmes 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 visits (Niño-Zarazúa 2011). The programme is centrally run by a federal agency that identifies and selects programme beneficiaries through a system that involves: (i) a geographical 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 should fall below a food-based poverty line, officially known as the 'minimum welfare line' (MWL), which identifies those in extreme poverty, or below a capabilities-based poverty line (CL), officially known as the 'permanent socioeconomic conditions verification line' that identifies those in poverty. The CL is the sum of MWL plus education and health expenses. Households are entitled to the *Oportunidades* programme if their predicted disposable income falls below the MWL; they are graduated from the programme if their predicted disposable income is above the CL (SEDESOL 2013).

When a household joins the programme, its predicted disposable income is assessed and recertified three years after enrolment. *Oportunidades* operation rules indicate that the recertification process should take place between the third and sixth year and between the third and fourth year in rural and urban areas, respectively. If the estimated disposable income is higher than the MWL but lower than the CL, then the income supplement is reduced in the subsequent three years over a pathway that is referred to as the '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, so far the response has been limited as this can be done only four years after graduation. If the probability of future eligibility spells could be predicted, programme administrators could calibrate their decisions about whether to keep a household in, or drop a household from, the programme.

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). Broadly, 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 well-being (e.g. health, education, food consumption, or income) over *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; Moser 1998; Naudé et al. 2009; Zhang and Wan 2009). The second approach is based on binary transition matrices that estimate the probability of a household in poverty to become non-poor and, similarly, that of a non-poor household to become poor (Cappellari and Jenkins 2004, 2008; Jenkins 2011). Since *Oportunidades* relies on well-being thresholds that divide the population into eligible and ineligible, and given that the current well-being status may be associated with both previous experiences of poverty and programme participation, the method used in this paper follows the second approach to modelling eligibility dynamics to the benefits of *Oportunidades*.

More specifically, our approach is based on a Markovian model that estimates the probability of being poor (or eligible to receive a cash transfer) in time *t*, contingent on the state dependence of being poor in time *t*-1, controlling for initial condition effects and attrition in unbalanced panels (see Cappellari and Jenkins 2002, 2004; Jenkins 2011). Markovian models are convenient in cases of limited longitudinal information, as they only require pairs of *t* and *t*-1 periods. Jenkins (2011) has pointed out that Markovian models, which are expressed in terms of probability (probit or logit) estimators, are superior to other alternatives in some 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 predicts the probability of being eligible in the next immediate period. This is in contrast to hazard regression models that are based on predictions of the duration of eligibility spells.

In principle, we could resort to a single probit model to assess the probability of a household becoming eligible to receive a cash transfer by remaining a programme participant. In such a case, the observed covariates in time *t*-1 could be used as predictors of the eligibility status in time *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 time *t* relative to the eligibility status in time *t*-1. According to Cappellari and Jenkins (2008), the eligibility of a household to receive a cash transfer could be associated with unobserved behavioural factors and actions that are related to previous programme experiences. A single probit model, in that context, would be a naïve approach to modelling eligibility transitions. Thus, unobserved heterogeneity and state dependence are simultaneously modelled in this study to obtain consistent probability estimates in time *t*.

Four simultaneous components for the modelling of eligibility transitions have been taken into consideration here. First, the estimation of the eligibility status of a household in the time *t*-1,

which controls for the state dependence of the eligibility status at *t*. Second, the modelling of the probability that a household observed in time *t*-1 is retained in time *t*. The latter controls for unobserved heterogeneity that could bias the results. Third, the estimation of the eligibility status in time *t*, which provides the main input of analysis. And fourth, the correlations of the first three components that are observed in the assessment of how the state dependence and unobserved heterogeneity may affect the estimations of the eligibility transitions in the current period. These four components depend on the availability of observable covariates in time *t*-1.

We follow Jenkins (2011) and consider the case that for i=1, … , N households, the propensity of being eligible to a transfer programme in time *t*-1 is given by

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

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

We also assume that a household whose eligibility status is observed in *t*-1 is also observed in time *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, and ξ_{it} is the white noise error. v_{it} is assumed to be normally distributed, with an expected value of one and a variance of zero. Similar to the previous case, a household is retained when $r^*_{it} > 0$, that is, $R_{it} = 1$. 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 is eligible, but if and only if $R_{it} = 1$.

The model of eligibility transitions also allows us to examine 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), (2), and (3), respectively, are assumed to have a trivariate standard normal distribution. Therefore, the correlations between residuals 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 to be eligible in time *t*-1, and exhibits a lower propensity to being attrited in time *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 time *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 becoming) 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 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 here is to estimate the *entry rate*, that is, the predicted probability of programme eligibility (or predicted entry rate) in time *t* when a household is ineligible in time *t*-1. The predicted entry 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 as

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

The quotient $1/s_{it}$ is also defined as the mean duration of the eligibility status and provides information on the period after which an upward mobility in the eligibility status can be expected. Non-eligible households are considered to be ready to leave the programme as they do not comply with the eligibility criterion in time *t*-1, irrespective to their particular entry likelihood in time *t*. The analysis in 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 an eligibility status by the following log-likelihood equation

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

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 time *t*-1 and pooled socioeconomic information for each household in time *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) have suggested the estimation of the parameters by simulation using a certain number of draws, following Gourieroux and Monfort (1996). As discussed in Section 6.1, our estimates have been obtained after running a simulation with 320 draws for urban and rural areas.

5 Data

We use the 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 collaboratively by the National Council of Science and Technology, Universidad Iberoamericana (Ibero-American University), the Centro de Investigacion y Docencia Economica (CIDE, Centre for Economics Research and Teaching), and the Instituto Nacional de Estadística y Geografía (INEGI, National Institute of Statistics and Informatics). 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; a second wave (MxFLS-II) was collected during 2005–06, with a re-contacting rate of 88.5 per cent; and a third round (MxFLS-III) was collected during 2009–12, with a re-contacting rate of 83.5 per cent.

The MxFLS follows a probabilistic, stratified, multi-staged, and independent sampling frame designed to be nationally representative for the rural and urban Mexican population. As Rubalcava and Teruel (2004) have pointed out, the sampling frame involved a random selection of localities in the 32 Mexican states as well as a random selection of households within the localities. The intended sample size was set for both rounds at 8000 households and 35,000 individuals with an oversampling that considered a retention rate of 90 per cent. The survey was collected in each round between the months of April and July. The questionnaire integrated ten modules that included information on household profiles, consumption expenditure, income, intra-household dynamics, and cognitive skills.[7]

5.1 Income calculation

Since we focus on current eligibility to programme entitlements, we calculate the household disposable income following INEGI's methodology (INEGI 2013).[8] The calculation of household disposable income, upon which official figures on poverty and inequality rely, is based on 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 and financial assets, ownership of intellectual property, and profits from firms owned by household members. Third, transfers from private or public sources; the latter include pensions, cash, and in-kind transfers from friends, relatives, donations, charity, or state programmes. Finally, income from housing rents. Each house-owner was asked about how much they would have paid if they rented the house they occupy. The estimated value of rented houses was added to the disposable income, assuming that house-owners dispose the income not allocated to housing rents.

Several challenges emerged when calculating income with the MxFLS. In 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 was considered. To address this limitation, we adopted the following steps. First, we compared the information in MxFLS-I with that of MxFLS-II to identify those households that still lived in the same own house. We found that 97 per cent 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 to MxFLS-I. Finally, we used the

[7] All rounds and corresponding questionnaires and supplementary materials are freely available on the project's webpage: http://www.ennvih-mxfls.org/.

[8] All prices in MxFLS-I, MxFLS-II, and MxFLS-III are deflated to prices of December 2009.

housing component of the consumer price index generated by INEGI to deflate rental values to the corresponding month of the survey in 2002.

In addition, while household participation in *Oportunidades* was explicitly reported in MxFLS-I, it was not in MxFLS-II. The programme experienced a significant increase in coverage between 2002 and 2005. MxFLS-II collected information on *Oportunidades* participation. The answers to the questions about programme participation were not included in the dataset available on the MxFLS webpage. This information would have been essential to describe the dataset from a participation point of view beyond the single eligibility status. This omission, however, did not affect our estimates, as we attempted to assess household eligibility for *Oportunidades* without the income transfer from the programme.

Recall that the eligibility of a household to participate in *Oportunidades* relies on a predicted disposable income below the MWL, with households with an 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 and 49 years of age. Given that a household's eligibility transition could entail some members turning older than 22 or 49 years of age, in our analysis we included those households with members under 15 and 42 years of age in 2002. This allowed us to focus on 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 1027.35 Mexican pesos for urban and rural areas, respectively. For MxFLS-II and MxFLS-III, the poverty lines were indexed using the consumer price index at the corresponding month of each survey. Table 1 displays the mean income and proportion of households below the CL. It indicates that 37.3, 30.7, and 32.2 per cent of Mexican households were identified with income below the CL in MxFLS-I, MxFLS-II, and MxFLS-III, respectively. In Mexico, the poverty incidence is higher in rural areas; however, instead of worsening, the poverty incidence slightly declined in the observed period. Contrarily, in urban areas, the poverty incidence increased between the last two survey rounds.

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

Survey round	MxFLS-I	MxFLS-II	MxFLS-III
Average per capita income	5053	5721	6852
Proportion below CL	0.373	0.307	0.322
Average per capita income—Urban	6201	7010	8022
Proportion below CL—Urban	0.288	0.221	0.241
Average per capita income—Rural	3325	3891	4595
Proportion below CL—Rural	0.493	0.438	0.425

Note: Income in Mexican pesos at nominal prices for each year.

Source: Authors' estimates from MxFLS-I, MxFLS-II, and MxFLS-III.

5.2 Covariates

Appendix Table A1 presents the selected covariates used to predict the transition probabilities. Several of these characteristics and their influence in poverty dynamics have been studied by Moser (2008). We clustered the covariates according to their role in household living conditions that may drive eligibility transitions. Our first group of covariates included the physical characteristics and accessibility of the house to public services, which reflect the living standards of the household. Better physical characteristics were expected to generate negative effects on the transition into eligibility. The second group of covariates detailed individual characteristics of the head of the household (i.e. either the main breadwinner or whose influence in the household decision-making is determinant), including his or her age, gender, and years of education, as well as those of his or

her spouse. These characteristics were treated as proxy indicators for the human capital endowment of the household.

A third set of covariates included the number of children of other members of the household, their mean age and years of education, health status, and dependency ratio. These variables served to predict the eligibility transition probabilities, given that households with higher dependency ratios and low human capital endowments are expected to exhibit higher likelihoods of falling below the eligibility threshold. We also included a vector of physical assets that helps households generate income or cope with negative shocks, including the ownership of a house, vehicle, electric appliances, livestock, and poultry.

Finally, the last group of covariates represented the idiosyncratic and covariant shocks that a household has endured in the last five years. Idiosyncratic shocks comprised the death of any household member and whether any member suffered an accident. The vector of covariant shocks captured whether a member had lost his or her employment and/or had been victim of a natural disaster and/or crop loss. All these contingencies were expected to be positively correlated, with a descending transition from ineligibility to eligibility.

Broadly, the sets of covariates indicate that households lived predominantly in houses with a firm cement floor and walls of hard materials. Rural areas exhibited low latrine use as type of toilet, whereas access to electricity was found to be almost universal, particularly in urban areas. As expected, physical attributes depicted lower standards of living among eligible versus ineligible households (see Appendix Table A1).

6 Results

We turn to the transition matrix of household eligibility between MxFLS-I (2002) and MxFLS-II (2005–06) and between MxFLS-I (2002) and MxFLS-III (2009–12). As pointed out earlier, programme eligibility is determined by the CL income threshold which guarantees the permanence of beneficiaries in the programme in urban and rural areas. The transition matrix considers the sample with unattrited and attrited households following the Jenkins (2011) framework. Later on, we run the model on the full sample with attrited households.

Table 2 presents the transition matrices as result of the analysis of the three rounds of the MxFLS. The figures obtained are similar to those reported by the Consejo Nacional de Evaluación de la Política de Desarrollo Social (CONEVAL) (2009), in the sense that eligibility to *Oportunidades* and poverty rates follow a similar trend. We start this description from urban areas by using the unattrited sample. Relevant to our analysis, it is observed that 17.7 and 22.4 per cent of ineligible households in MxFLS-I became eligible in MxFLS-II and MxFLS-III, respectively. This implies that households that were not entitled to the programme in 2002 fell below the eligibility threshold in 2005–06 as they could be classified as occasionally or usually poor. Contrarily, these results also indicate that 67.2 and 67.1 per cent of urban eligible households in MxFLS-I became ineligible in MxFLS-II and MxFLS-III, respectively. In the context of the implementation of *Oportunidades*, these households could have participated in the programme in 2002 and then be dropped either in 2005–06 or in 2009–12.

The rural transition matrix is also shown in Table 2. Interestingly, implications for the eligibility dynamics of *Oportunidades* were found to be strong, with the flow of households below and above the eligibility threshold being higher than that in urban areas. In fact, 32.2 and 35.5 per cent of ineligible households in MxFLS-I became eligible in MxFLS-II and MxFLS-III, respectively. The proportion of rural eligible households in MxFLS-I that became ineligible in MxFLS-II and

MxFLS-III was lower than urban ones, with 57.2 and 58.7 per cent using the unattrited and attrited samples, respectively. The results of the eligibility transitions in rural areas also show that the proportion of eligible households that remained eligible in MxFLS-III was lower than in MxFLS-II. This trend was not observed in urban areas, where the proportion of eligible households remained stable. Despite the fact that the 2008–09 financial crisis severely hit the country in the period between MxFLS-II and MxFLS-III, data show that rural households were not significantly affected. In fact, the offset in the flow of households below and above the eligibility thresholds follows a similar trend to the one observed for the poverty incidence estimated by CONEVAL (2009).

Table 2: Transition matrix

Eligibility defined by CL	Eligibility at *t* (MxFLS-I to MxFLS-II)			Eligibility at *t* (MxFLS-I to MxFLS-III)		
	Ineligible	Eligible	Missing	Ineligible	Eligible	Missing
Eligibility at t-*1 (urban)*						
Sample with unattrited sample						
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
Eligibility at t-*1 (rural)*						
Sample with unattrited sample						
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

Note: All figures in percentage.

Source: Authors' estimates from MxFLS-I, MxFLS-II, and MxFLS-III.

In a complementary analysis to the transition matrix, Table 3 presents the eligibility dynamics following the analytical framework described in the previous section, which consists of the characterization of households according to their poverty trend. As seen in Table 3, 52 and 41.6 per cent of households were identified as never poor or eligible in urban and rural areas, respectively. On the other hand, 12.5 and 11.7 per cent of households were identified as always poor or eligible to stay in the programme in urban and rural areas, respectively. This implies that the eligibility dynamics of *Oportunidades* is determined by the transient poor who represent 35.5 and 46.7 per cent of households in urban and rural areas, respectively. This confirms that higher poverty dynamics were observed in rural areas as shown in the transition matrix of Table 2. The results shows that only 10.7 and 11.6 per cent of households in urban and rural areas, respectively, could have been dropped from *Oportunidades*, since they could be identified consistently as escapees from poverty. Although these households were eligible in MxFLS-I, they were ineligible in subsequent rounds.

Table 3: Eligibility dynamics

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: Authors' estimates from MxFLS-I, MxFLS-II, and MxFLS-III.

In the following section, we identify households with high probabilities of exiting poverty as a condition for graduation from the programme.

6.1 Estimation of transition probabilities

We turn now to the results obtained from the estimation of the predicted transition probabilities derived from Equation (9). The multivariate probit is estimated by running a simulation with 320 draws for urban and rural areas. This number of draws was identified after the model showed stable results; that is, after 320 draws the coefficients and their significance level remain unchanged. 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).

Table 4: Model specification tests of hypothesis

Eligibility defined by CL	Rural		Urban	
Correlation 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 hypothesis	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: Authors' estimates from MxFLS-I, MxFLS-II, and MxFLS-III.

Overall, the correlation between initial eligibility status and unobserved characteristics, which drives attrition, ρ_1, is small and negative in urban areas but not statistically significant in either rural or 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 the null hypothesis that being eligible in MxFLS-I makes remaining eligible in MxFLS-II and MxFLS-III more likely.

This suggests that *Oportunidades* may generate state dependence by creating incentives for beneficiaries to keep their eligibility status. The correlation between unobserved characteristics affecting attrition and current eligibility status, ρ_3, is positive and statistically significant, indicating that ineligible households in time *t* are more likely to attrit. This implies that never eligible households are hard to follow by the programme in the targeting or recertification process as they tend to leave the survey. Results at the bottom end of Table 4 show that the joint correlation

coefficients are different from zero, indicating that the assumption of joint exogeneity cannot be rejected, and hence the model is correctly specified for the prediction of transition probabilities.

Appendix Table A2 presents results from the estimation of the predicted transition probabilities. An important number of covariates turned out to be significant in rural areas. Significant covariates indicate the extent to which they contribute to the transition below and above the eligibility threshold, particularly in time *t*. Rural households living in houses with concrete or bricked walls, tap water inside the house, and a complete ownership of the house were found to be less likely to fall into poverty. Similarly, households were less likely to be eligible to receive *Oportunidades* in *t* if they counted on an older and more educated household head and if they had poultry as an asset. Household members seem to play an important role, as older households with higher levels of education and school attendance are associated with higher transitions into ineligibility. On the other hand, households with higher number of young children, higher dependency ratios, and a lost crop in the past five years were more likely to fall into eligibility.

Some covariates overlap in their significance in urban areas. In fact, urban households living in townhouses, with concrete wall materials and tap water, owning their house, having a garbage collection facility, and having an older, male household head were found to be 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 also allow us to calculate the entry and exit rates. Following existing literature on vulnerability, we define a critical threshold in the entry rates of 0.5, over which a household is more likely to become or remain eligible, as we expect them to remain always poor, while programme exit rates are set at values greater than 0.5, which translate into high probabilities of escaping poverty. Overlapping between entry rates is possible as households can exhibit different probabilities in both cases.

Table 5 shows the results of the predicted entry and exit rates. In urban areas, 38 per cent of the population was found to be likely to remain or become eligible for *Oportunidades*, whereas 33.2 per cent was more likely to become or remain ineligible. Relevant to our analysis is the finding that 34 per cent of ineligible households in the baseline were likely to become eligible in 2009. This is an important finding as *Oportunidades* administrators may graduate households because their earnings have crossed the CL threshold at a given point in time, in spite of exhibiting a high probability of becoming poor or eligible to receive the cash transfer in the following rounds of the survey.

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

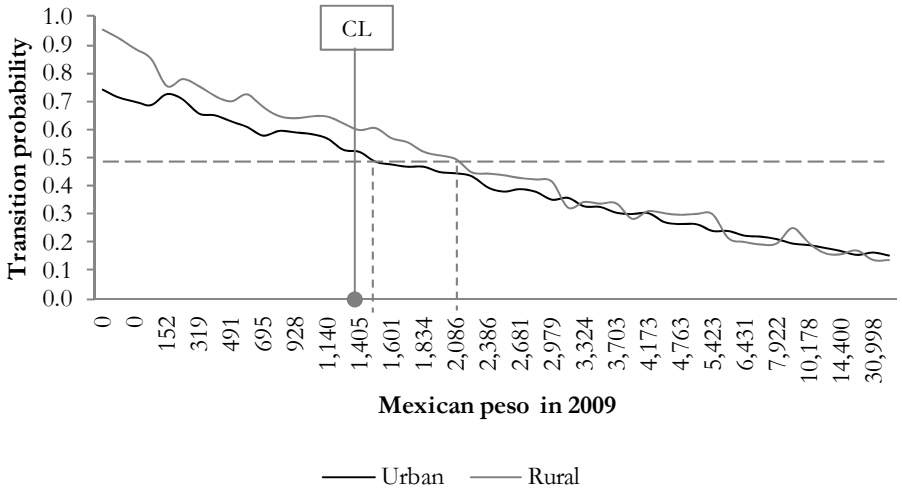
Note: Entry and exit rates calculated by predicted transition probabilities.

Source: Authors' estimates from MxFLS-I, MxFLS-II, and MxFLS-III.

Only 26.7 per cent of urban ineligible households could have graduated without experiencing a high probability of backsliding into the programme eligibility threshold. In rural areas, entry rates were found to be higher than in urban areas, whereas the exit rates were roughly similar in both contexts.

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 the assessment of the poverty status of beneficiaries is costly and carried out every three years. Our results indicate that urban households experience an expected eligibility duration of 3.5 years whereas the average eligibility duration in rural areas is 4.1 years. On the basis of the predicted entry rates, we explored the entry probabilities of ineligible households in MxFLS-III over the observed per capita household disposable income at December 2009 prices. We also identified the income threshold above which the probability of being eligible would be below 0.5 in urban and rural areas. Beneficiaries could thus be dropped from the programme after their predicted disposable income had risen above this threshold. Figure 2 illustrates this by showing how entry probabilities decline with higher levels of disposable income in MxFLS-III.

Figure 2: Predicted entry probabilities and household per capita income—ineligible in Mexican Family Life Survey (MxFLS) III



Source: Authors' estimates from MxFLS-I, MxFLS-II, and MxFLS-III.

Our results suggest that in MxFLS-III the low entry threshold for the *Oportunidades* programme could be placed at 2086 and 1511 Mexican pesos at 2009 prices for urban and rural areas, respectively. These values could be considered in an eventual graduation strategy for the programme, since the current CL is placed where the entry rates are significantly high. In fact, the entry rates in urban and rural areas at the CL were found to be 55 and 65 per cent in urban and rural areas, respectively. The withdrawal of ineligible households at the current CL leaves them with a high risk of being eligible. In contrast, any per capita income value higher than the low probability threshold will, at least, take into account a low eligibility risk.

7 Conclusions

This paper has provided an analysis of the implications of poverty dynamics for the eligibility status of beneficiaries of Mexico's *Oportunidades* programme as an important element of its graduation or exit conditions. Programme eligibility is not static over time. In an ideal scenario, households would transit from an eligible to an ineligible status after receiving programme treatment for a given period. To date, most transfer programmes respond to upward income transitions by dropping beneficiaries with no major consideration for the welfare dynamics that may occur.

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. We highlight the relevant conditions that *Oportunidades* could consider before graduating programme participants, particularly the strong influence that poverty 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 on 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.

Our results suggest that just about one-third of ineligible households can be considered to be true graduates who exhibit low probabilities of becoming eligible in the future. Our results also show that the recertification process of *Oportunidades*—which takes place every three years—could be optimized by taking place every 3.5 and 4.1 years in urban and rural areas, respectively.

An important policy consideration relates to the question of whether cash transfers should be stopped abruptly or gradually. Gradual phasing out of transfers has been adopted by tax credit schemes in OECD countries such as the United Kingdom and the United States. The slope of the declining line has been based on labour incentives that arise in the absence of the transfer. The decision of whether transfer programmes should opt for an abrupt or gradual phasing out process is beyond the scope of this paper. However, we point out that in the context of human development cash transfer programmes such as *Oportunidades*, the slope curve would need to consider factors such as the long-term formation of human capital and household resilience to idiosyncratic and covariate shocks.

To our knowledge, this is the first study that analyses programme graduation from an eligibility dynamics 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.

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	14.02	44.96	13.56	39.88	11.24	42.29	12.48
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's age	30.31	19.11	33.05	18.64	29.77	16.51	30.60	18.04
Spouse's 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	22.49	7.073	24.64	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 education of household members	7.706	2.637	8.356	2.748	8.967	2.801	9.233	2.842
Number of children under 6 years	0.992	1.005	0.809	0.902	0.872	0.883	0.708	0.821
Number of children under 15 years	2.648	1.643	2.253	1.488	2.180	1.312	1.853	1.194
Mean age of children	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	

Note: *Dependence ratio is defined as the number of members under 14 years and over 65 years divided by the number of members between 15 and 64 years of age. (1) Eligibility according to CL; (2) Weighted number of observations.

Source: MxFLS-I.

Table A2: Transition probabilities estimation

Dependence variable: Below CL = 1	Rural	Urban
Physical characteristics		
Type of dwelling		
Sole house/ does not share walls	0.071 (0.086)	-0.148*** (0.045)
Floor material		
Firm cement	-0.064 (0.062)	0.080 (0.062)
Walls material		
Concrete/ partition/ brick/ block	-0.178** (0.086)	-0.241** (0.121)
Roof material		
Concrete/ partition/ brick/ block	-0.021 (0.066)	0.008 (0.071)
Source of drinking water		
Tap water inside the dwelling	-0.015** (0.006)	-0.136*** (0.046)
Type of toilet		
Latrine	0.031 (0.047)	-0.042 (0.105)
House has electricity	-0.063 (0.145)	0.075 (0.306)
Telephone landline	-0.097 (0.101)	-0.062 (0.068)
Own paid house	-0.056*** (0.013)	-0.142** (0.060)
Sewage service	-0.007 (0.056)	-0.098 (0.094)
Garbage collection service	-0.064 (0.129)	-0.192* (0.104)
House surrounded by residues	0.174 (0.174)	0.003 (0.179)
Persons per bedrooms	0.038* (0.022)	0.057*** (0.016)
Household head		
Age	-0.005*** (0.002)	-0.009*** (0.003)
Male = 1	-0.059 (0.116)	-0.179** (0.089)
Years of education	-0.024** (0.012)	0.007 (0.008)
Spouse's age	0.000 (0.001)	0.002 (0.002)
Spouse's years of education	-0.021 (0.033)	0.004 (0.011)
Other household members		
Mean household age	-0.009** (0.004)	-0.008 (0.005)

Mean household years of education	-0.003 (0.030)	0.007 (0.025)
Max. years of education of household members	-0.026** (0.011)	-0.016 (0.011)
Number of children under 6 years	0.133*** (0.042)	0.092* (0.053)
Number of children under 15 years	0.066** (0.018)	0.062 (0.041)
Mean age of children	-0.007 (0.007)	0.005 (0.005)
Dependency ratio*	0.063** (0.031)	0.112** (0.046)
Pregnant in the household	0.084 (0.141)	0.074 (0.057)
Member with chronic illness	0.073 (0.050)	-0.056 (0.062)
Children attend school	-0.121* (0.072)	-0.002 (0.078)
Assets		
Household owns other house	-0.005 (0.096)	0.003 (0.059)
Bicycle	-0.071 (0.066)	0.087 (0.071)
Vehicle	0.001 (0.059)	0.001 (0.076)
Electric appliances	-0.117 (0.100)	-0.250 (0.201)
Washing machine	0.007 (0.176)	0.178 (0.241)
Financial assets	-0.379*** (0.132)	-0.068 (0.076)
Agricultural machinery	-0.385** (0.111)	-0.167 (0.147)
Cows	-0.017 (0.078)	-0.147 (0.213)
Horses	0.022 (0.035)	0.379 (0.250)
Pigs or goats	-0.041 (0.073)	-0.011 (0.165)
Poultry	-0.143** (0.059)	0.018 (0.115)
Shocks in the last five years		
Household member died	-0.031 (0.078)	-0.123 (0.085)
Household member suffered accident	0.084 (0.145)	0.075 (0.060)
Household member lost employment	-0.044 (0.131)	-0.093 (0.089)
Household was victim of natural disaster	-0.449 (0.688)	-0.037 (0.248)
Household lost a crop	0.230** (0.009)	0.290** (0.145)
Number of observations (households)	3,977,433	13,277,512

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%.

Source: MxFLS-I, MxFLS-II, and MxFLS-III.

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