

Mobility in Rural Credit Markets: A Honduran Case Study

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Abstract

In this paper I analyze mobility in rural credit markets. A panel data set of rural Honduran households is used to study credit market transitions; specifically, the dynamic evolution of formal and informal sector participation. Mobility patterns among four different credit market states are analyzed, namely those who have formal sector participation, informal sector participation, participation in both sectors and non-participation in rural credit markets. I use a random effects dynamic multinomial logit model which can accommodate unobserved heterogeneity. The main findings are that state dependence plays a significant role in ones ability to borrow.

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Introduction

In the 1990's, much of Latin America underwent massive reforms aimed at liberalizing factor markets. These reforms were a response to low growth rates in the 1990's, worsening of income distribution and rising poverty among the rural poor (Boucher et. al. 2002). It is well established in the literature that poverty reduction and general economic well-being can be achieved through better access to credit markets. This is because the poor, who are often liquidity constrained, need credit to finance their investment. The rural poor, however, often find themselves rationed out of the credit markets due to moral hazard, risk and adverse selection problems.

Different institutions have developed different mechanisms in order to overcome moral hazard, adverse selection and other asymmetries. To the extent that different institutions offer different borrowers opportunities (contracts), the types of institutions accessible to borrower will influence the type of investment they make. This has been long recognized, and extensive literature exists that examines how households and lending institutions are matched. Most of this has not taken into account, however, the role of credit history. This gap in the literature can be explained by a lack of data.

Recent theoretical and policy work has examined the determinants of a borrower's ability to transition from one type of institution to another. This said, is it is not clear if individuals who have borrowed in the past are more likely to borrow in the future (and will have an easier time doing it) than those who have not participated (or not been able to participate) in the credit markets due to voluntary or forced rationing. The key issue is the difference between the likelihood of participation and the propensity to participate. Therefore, the important question to ask is does the ability to borrow depend on ones credit history (true state dependence) or is it the case that some individuals are inherently less likely to participate due to the presence of some unobserved characteristics (spurious state dependence)? This paper first explores the role of true

state dependence and unobserved heterogeneity. Understanding the determinants of state dependence has important policy implications.

There are two competing views about transitions in rural credit markets. The first is that a transition to formal institutions from an informal sector is a preferred outcome. The main reason is that the formal credit markets are regulated while the informal markets tend to be devoid of regulation and mainly consist of money lenders and traders who are more likely to offer exploitative contracts or charge high interest rates. In the formal sector, on the other hand, interest rates tend to be lower and loan size and terms of contracts are better. However, the formal sector has high collateral requirements. According to this view if a household borrows from an informal source it must be the case that the price of the loan (including transaction costs) or the formal sector collateral requirements are too high. That is, these households applied for formal sector loans that were denied or else knew they would be denied and did not even apply (Mushinski, 1999)¹. Once denied, these households turn to the other institutions namely informal sources to finance their investments, however exorbitant the terms of the contract. Hence, a transition from informal to formal is an efficient and desired outcome.

The second view sees the two sectors as substitutes because they offer distinctive contracts. That is, for some borrowers it is more efficient to borrow from the formal sector while others may find it advantageous to borrow from the informal. For example, a poor farmer who requires a short-term loan to buy seeds or fertilizer may find the collateral and administrative requirements of the formal sector to be prohibitive. A seasonal loan from the informal sector where history tends to be used as collateral may lower the risk or burden of poor households (Irfan, A and Ray, D & Ghosh, P). Households thus choose the sector that offers them the most lucrative contract for their specific requirement. In this view, borrowers are not thought of as transitioning to the formal sector from the informal sector or vice versa; their choice of which

¹It could also be the case that most rural poor households may choose to not enter the formal markets due viewing the process too complicated.

sector to participate in is just an matter of efficiency. Empirical studies, it must be added, suggest that in many cases loans from the formal sector are not possible for poor farmers and therefore they are forced to participate in the informal sector by default not choice.

It should also be clear that these two views imply distinctive policy approaches. If policy makers believe that collateral requirements or transaction costs, for seasonal small loans, are the main deterrent to participation in formal credit markets, then offering smaller loans with low collateral requirements should increase participation of small borrowers. Transaction costs here could reflect complicated language or paper work needed to process loans as much as time spent pursuing the loans. Understanding the terms of the contract may be daunting to the relatively uneducated farmer. If poor landless farmers are unable to offer collateral for larger loans (to purchase land, for example) then using alternatives to collateral may be needed. For example, if credit history can serve as collateral, then investing in credit bureaus may be an policy alternative. Credit bureaus might then eliminate the moral hazard problem, and help to increase the volume of credit dispersed².

The main contribution of this paper is to examine the importance of participation (or borrower) history in determining access to credit. A panel data set of rural Honduran households is used to study credit market transitions; specifically, the dynamic evolution of formal and informal sector participation. The evolution of the rural credit market in Honduras is made particularly interesting by the recent liberalization of rural credit and land markets that has emphasized less state involvement and more titling of land with the hope of improving credit access for the rural poor. Mobility patterns among four different credit market states are analyzed, namely those who have formal sector participation, informal sector participation, participation in both sectors and non-participation in rural credit markets. These patterns vary across different

² There is a vast literature that discusses the merits of credit bureaus. Some questions surrounding this are whether or not they are really needed and whether information on borrowers can be collected and verified. Credit bureaus are expensive to maintain. Furthermore, there is always the fear that credit bureaus will become political institutions. These issues although very relevant are not dealt with here.

departments and individuals during periods of both state involvement in financial markets and increased privatization of financial markets (Boucher et. al. 2002).

An important finding in this paper is that taking into account unobserved heterogeneity ‘true’ state dependence really matters. That is past choices of participation or non participation play a significant role in determining future credit access. Specifically, previous participation increases the likelihood of securing future loans. Further, the informal sector plays an important role for poor farmers in helping some of them to eventually obtain formal loans.

The remainder of the paper is organized as follows. Section 2 has two main objectives. First it provides a brief description of the survey methodology and the socio economic context of the research site. Second, it describes the structure of rural credit markets including entry and exit in to credit markets and the general terms of contracts in both the formal and informal sectors. I present descriptive statistics on the size of the four sectors in each year and on the transition probabilities. The econometric model is discussed in Section 3. I use a reduced form dynamic multinomial logit model for panel data with random effects, explaining credit market participation for each individual in each time period. The model is a variation of the Markov models proposed in Heckman (1981a) and Magnac (2001), true state dependence and heterogeneity is distinguished by including dummies for one period lagged credit market state, as well as unobserved individual random effects.

The estimation results are presented in Section 4. In order to interpret the meaning of parameter estimates, I use the model to simulate transition probabilities for the groups with various background characteristics. Finally, Section 5 reviews the main contributions of this paper and emphasizes the need for further research on the dynamic nature of credit markets.

Section 2: Data Description

The panel dataset used in the analysis is constructed from four waves of data collection by three research teams. It follows land and 450 rural households from four departments in rural

Honduras: Ocotopeque, Santa Barbara, Comayagua and Yoro. The baseline study was conducted by the Land Tenure Center at the University of Wisconsin in 1983-84 for two of the four departments and then in 1988-89 by the same research team from two other departments. Of the original sample, Ramón Lopez and the World Bank team re-surveyed 450 households in 1994. The last wave was in the spring of 2001 as part of a project funded by the European Community, U.S. AID, and the World Bank.

The original sample was designed to capture the variation in land distribution. The households were chosen from a list of land parcels prepared by the government for a titling program and they were chosen from this list to ensure representation of all farm sizes³. This sample was aimed at evaluating the impact of titling program during the 1980's in the coffee growing regions of rural Honduras. Furthermore, to be part of this sample, households needed to either to have 5 hectares of land or to dedicate 1 hectare of land for coffee. Because of the dearth of very small farms and landless households, the full land distribution in these four departments are not represented. Consequently, this data set tends to undercount rural households without land (or small holdings) and households with large holdings. Table 1 provides evidence to support the claim above. In all four periods there are no landless households. Over half of the households have less than 10 manzanas of land and approximately 42 percent of the households have greater than 10 manzanas of land. It is interesting to note that the distribution of land among these households has remained fairly stable over the 1984-2000 time period.

Although there is some attrition in terms of individuals within the data , the main weakness of this dataset is that the first two waves of the data included only limited information in terms of credit access. The newer waves of data collection evolved to include more information pertaining to household choices and farming decisions. The strength of this dataset is the fact that it tracks households involved with these parcels over time. This gives us some insights into the

³ For more details on the sampling methods see Barham et al. (2002) and Seligson et al. (1983), Nesman and Seligson (1988), and Seligson and Nesman (1989)

dynamics of household decisions, albeit not comprehensive, over the same time span. While the information on land is the focus of this dataset, there is information on credit market participation for all four periods.

Apart from the availability of data for multiple time periods Honduras makes an interesting case study for studying credit market participation for two reasons. First, state involvement in financial markets was really high in the 1980's (Larson et al., 1999). This meant the main source of credit was either governmental or friends and family. Second, in 1992 Honduras passed a land reform package called Law of Agricultural Modernization and Development of the Agricultural Sector (LMDSA). The focus of LMDSA was to improve property rights, activate land rental markets and deepen titling initiatives. It simultaneously encouraged privatization of rural financial markets and liberalized rural interest rates (Boucher et al. 2002). Thus, examining the Honduran case will provide valuable insights about the transition to institutional credit or away from it post liberalization.

Table 1. Land Distribution by Year

Year	1984	1988	1994	2000
Land Owned in manzanas	n=444	n=436	n=526	n=522
0mz	-	-	-	1.71
0-2 mz	27.25	24.77	19.58	26.43
2-5mz	17.34	20.18	17.87	16.16
5-10mz	15.54	17.89	17.3	13.31
10-20mz	16.44	12.84	19.01	15.59
20-50mz	14.41	15.6	16.16	14.45
>50mz	9.01	8.49	10.08	12.36

Table 2 shows the extent of participation of sample households in credit markets in the four periods. The formal sector is comprised of commercial, state and traditional banks. The informal sector includes all non-institutional lenders, private lenders and family/friends. Participation is widespread in all four periods. Over 70 percent did not participate in the credit markets prior to reforms and about 50 percent did not participate post reforms. About 20 percent participated in the formal sector prior to reforms and post reforms. Perhaps the most striking

feature is the post reforms increase in participation that was experienced by the informal sector rather than the formal sector. Titling reforms seem to not have affected access to agricultural credit in the formal sector. This could be explained in part by the downsizing of BANADESA, the main state development bank, has at best been counteracted by more loans from other formal sources. One such source is BANCAFE which is quazi-public. Furthermore, institutional credit actually saw a decline in the number of borrowers. This can be explained in part by the emergence of non-governmental organizations (NGOs) extending credit to rural households⁴.

For participating individuals, the contractual terms, and collateral requirements across the formal and informal sector, (see Tables A1. and A2. in appendix A), the mean loan size in the formal sector is much higher than loans in the informal sector. In addition the average length of contracts is much higher in the formal sector. The formal sector requires collateral for 90 percent of loans of which 45 percent are land-based whilst only 42 percent of the loans in the informal sector require collateral of any kind. The data further shows that small farmers tend to borrow more short term loans with a mean size of 300 – 1000 Lempiras as compared to 1000 – 6000 by larger farmers.

Table 2. Participation in Rural Credit Markets by Year

Year	1984	1988	1994	2000
Sector	n=444	n=436	n=526	n=522
No participation	78.83	75.92	70.53	50.96
Loan from Institution	17.57	22.71	19.01	12.84
Loan from Informal Sector	2.7	1.15	9.13	25.29
Loan from both	0.9	0.23	1.33	10.92
Total	100	100	100	100

A summary of credit market transitions from 1983-2000 can be estimated by simple descriptive methodology. These estimates are presented below in the form of transition probabilities when the transition process is homogeneous Markov. The estimated transition

⁴ For the purposes of this analysis NGO's are included in the informal category, though these are really only evident in the 2000 data. The previous studies do not make much mention of NGO's. The 2000 survey was more comprehensive and may have somewhat more complete reporting.

probability from state i to state j is $p_{ij}=n_{ij}/n_j$ where n_{ij} is the total number of transitions from i to j (Magnac, 2000). The results shown in Tables 3 and 4 establish that the ability to secure a loan in the future is affected by past participation. These tables also emphasize the importance of the informal sector for the poor households. For example, an equal number of non-participants access the informal sector as the formal and 30 percent of previous informal sector participants borrow from the informal sector again.

More importantly, 17 percent of the households with previous loans in the informal sector were able to secure loans from the formal sector. Interestingly households that used both sectors in the past, borrowed either from formal or both sectors again but did not borrow from the informal sector exclusively. Households that have formal loans in their past continue to borrow from the formal sector. These results suggest that some form of hierarchy in which informal loans can be viewed as a stepping-stone to formal loans. While, having a formal loan might also help to secure informal loans the data does not point towards movement in that direction (only 9 percent turned to loans in the informal sector exclusively as compared to 37 percent that stayed with formal loans). The transition probabilities in the tables below show an informal loan is more likely to lead to a formal loan than a formal loan is to lead to an informal loan.

Table 3 Transition Probabilities for the full sample (no heterogeneity)

Final state → Initial State ↓	Non Participation	Formal	Informal	Both
Non Participation	71%	13%	13%	3%
Formal	45%	38%	9%	9%
Informal	45%	17%	31%	6%
Both	58%	17%	0	25%

Table 4 Transition Probabilities where initial state=1994 (no heterogeneity)

Final state 2000 → Initial State 1994 ↓	Non Participation	Formal	Informal	Both
Non Participation	55%	10%	27%	7%
Formal	44%	20%	12%	23%
Informal	34%	17%	40%	9%
Both	43%	14%	0	43%

It is interesting to compare the transition probabilities for the years 1994 and 2000 because the LMDSA was implemented in 1993. Comparing the pre-reform to the post reform era reinforces the findings for the full sample. In addition, new borrowers were almost entirely absorbed by the informal sector. This suggests that in the post-liberalization era the informal sector has become an even more important source of credit for poor farmers.

Section 3: Econometric Methodology

Let me begin with a conceptual framework for understanding credit market participation. For the sake of clarity, participation is broken down into four observational regimes (1) Non participation-that is no loans from either formal or informal sources; (2) Formal- loans only from formal lenders; (3) Informal- loans from informal lenders; (4) Both- loans from both formal and informal lenders.

It is important to note that two types of individuals belong to the non-participation regime. The first type of individual has the ability to self-finance and is therefore unwilling to borrow at the going rate (their demand for loans equals 0). The second type of individual is one that would be willing to borrow and could not (their demand for loans are positive). Clearly, which type of individual you are shapes your future choices as well. My ability to model these two types of non-borrowers is limited by the lack of data in the earlier round of the panel. This means I cannot make meaningful inferences about individuals in the non-participation regime using transition probabilities⁵. Nevertheless, there are many interesting insights to be gained from studying transitions to other states.

For a more systematic examination of dynamics of participation in credit markets a multi-variate analysis is needed. The approach taken is to use a dynamic multinomial logit panel data model with random effects to predict the probability that farmers with different characteristics

⁵ analysis is currently underway for deeper analysis of non-participants for the 1994 and 2000 rounds of the panel.

make transition to different states. This model is similar to the first order Markov model presented in Honoré (2001) and Gong (2000). The model distinguishes between ‘true’ and ‘spurious’ state dependence by including lagged state dummy variables as the explanatory variables and individual effects to control for unobserved heterogeneity. The individual effects are assumed to be independent of unobserved characteristics and follow a multivariate normal distribution.

The specification of the model is as follows, let Y be the categorical variable which represents the observed state, assume individuals i ($=1, \dots, n$) can be in any of the j possible states at time t . Y_{ijt} can be considered as the unobservable propensity of the individual to be in state j at time t and is modeled as a linear combination of an individual’s characteristics. Throughout the paper, I will use $J=4$: participating in the formal sector ($j=1$), participating in the informal sector ($j=2$), participation in both sectors ($j=3$) and non participation ($j=4$). The utility derived from state j ($j= 1,2,3,4$) in period $t>1$ is specified as

$$Y_{ijt} = X_{it}'\beta_j + Z_{it}'\gamma_j + \alpha_{ij} + \varepsilon_{ijt} \quad 1$$

Where X_{it} is a vector of explanatory variables which includes total land owned, farm and off farm income, age of the household head, education of the head of the household etc. The vector Z_{it} is comprised of lagged participation state. Here non participation is taken as the reference state. α_{ij} is the random effect component reflecting time constant unobserved heterogeneity. To identify this $\beta_1, \gamma_1, \alpha_{i1}$ are normalized to zero. The parameters to be estimated are then β_j and γ_j . The ε_{ijt} are i.i.d error terms. They are assumed to have a Type I extreme value distribution and independent of X_{it} , and α_{ij} . Hence, the probability for individual i to be in state j at time $t>1$, given characteristics X_{it} , random effects α_{ij} ’s, and lagged dummy states, can be written as

$$P(j | X_{it}, Z_{it}, \alpha_{i1}, \dots, \alpha_{ij}) = \frac{\exp(X_{it}'b_j + Z_{it}'\gamma_j)}{\sum_{k=1}^J \exp(X_{it}'b_k + Z_{it}'\gamma_k)} \quad 2$$

Define $\alpha_i = (\alpha_{i2}, \dots, \alpha_{ij})$. Assume that the α_i 's follow a multivariate normal distribution. Put differently, the α_{ij} 's are specified as linear combinations of J-1 independent N(0,1) variables:

$$\alpha_i = A\eta_i, \text{ with } \eta_i \sim N_{J-1}(0, I_{J-1}) \quad 3$$

where $A = J-1 \times J-1$ is a lower triangular parameter matrix to be estimated. The covariance matrix of α_i is then given by $\Sigma_\alpha = AA'$ (Frees, J 2003 and Baltagi 2002). For period $t=1$ a static multinomial logit model with different parameter slopes⁶ is used without including the lag. This model can be viewed as a linear approximation to the reduced form that would be obtained if the lagged dependent variables were replaced by their specifications according to the dynamic model for periods earlier than $t=1$. The model can be estimated by using Maximum Likelihood. If the random effects α_i were observed, the likelihood contribution of the i th individual in observed states j_1, \dots, j_T is given by

$$L_i(\eta_i) = P(j_1 | X_{i1}, \alpha_i) P(j_2 | X_{i2}, Z_{i2}, \alpha_i) \dots P(j_T | X_{iT}, Z_{iT}, \alpha_i) \quad 4$$

The above equation is relatively straightforward to compute. It is simply a sequence of multinomial logit probabilities. Since the individual effects are unobserved the likelihood contribution is given by the expectation of equation 4 such that:

$$L_i = \int_{-\infty}^{\infty} \dots \int_{-\infty}^{\infty} L_i(\eta_i) \varphi(\eta_i) d\eta_{i2} \dots d\eta_{ij} \quad 5$$

where $\varphi(\eta_i)$ is the joint density of η_i . Computation of the likelihood contribution in equation 5 involves J-1 dimensional integration. In my case $J=4$, and various numerical techniques exist to approximate the integral.

The variables used in the estimation process need description, beginning with the loan categories. First, due to the limited number of observations in the semiformal credit markets, the informal and semiformal sectors were collapsed into one category. Farmers who received loans,

⁶ The static model is given by $Y_{ij1} = X_{i1}'\pi_j + \theta_{ij} + \varepsilon_{ij1}$. Where θ_{ij} captures the random effects component and can be defined as a function of α_{ij} .

in any of the four periods, exclusively from institutional sources were labeled as participating in the formal sector. Farmers who borrowed only from any other source were placed in the informal category. Farmers who borrowed from both institutional and other sources were placed in the both category. A summary of the independent variables is available in Appendix A. A household's participation in the credit market depends on the amount of collateralizable wealth they possess. For this reason land owned, value of livestock and a dummy variable SomeTitle (indicates if the household has any land that is titled) is included. The variable SomeTitle is used instead of area of titled land because this information does not exist for all waves of the panel. Livestock is included in the regression because it is used as collateral in the informal sector. Income generated from farming and non-farming activities are also included in the regression because they serve as a proxy for the amount of liquidity the households possess. It is important to note that there may be an endogeneity issue here. For example, unobserved individual characteristics like inherent farming ability can generate biased estimates. The follow up to this paper will explicitly deal with this issue

The non-wealth variables are included in the regression to control for individual heterogeneity. The age of the household head serves as a proxy for experience. Education of the household head serves two purposes namely: highly educated farmers may be more likely to participate in the formal sector, because they are better able to process the loan applications, or well educated farmers may be more productive. Finally, higher levels of education may also imply higher social status which may result in easier access to credit in the formal sector. This suggests that farmers with high education should be positively correlated with participation in the formal sector.

The number of household members is also included in the regression because a larger number of dependents may imply a greater need to borrow. The expected sign of the regression can go either way depending on the relative wealth status of the household. Regional dummies are included to capture unobserved regional variation. Finally, a lag variable is included in the

regression. The lag variable serves to determine the role history plays in future participation in credit markets.

Section 4: Econometric Results

The results of the dynamic multinomial regression can be found in Appendix A. As described above, the parameters of the vector β_j in the multinomial regression framework describe the impact of individual characteristics on the probability of an individual i being observed in state j at time t relative the base category (non participation). Following Honoré this relative probability is given by:

$$\frac{\frac{P(y_{it} = j | y_{it-1} = k; \beta, \alpha)}{P(y_{it} = 0 | y_{it-1} = k; \beta, \alpha)}}{\frac{P(y_{it} = j | y_{it-1} = 0; \beta, \alpha)}{P(y_{it} = 0 | y_{it-1} = 0; \beta, \alpha)}} = e^{\beta_{kj} - \beta_{0j}} \quad 6$$

Normalizing $\beta_{0j} = 0$, means that a positive sign on parameter β_j and γ_j ($j=2,3,4$) means, that the corresponding variable has a positive impact on the probability to be in state j compared to the probability to be in the non participation state (the reference state).

Three models are estimated. The first is the static multinomial model for time $t=1$, where the independent variables only represent individual characteristic (X_j 's). The second is a pooled multinomial logit model with time dummies. The last is a dynamic multinomial logit with lagged states. The point estimates for all three models are presented in the appendix in Tables A.5.-A.7 respectively.

According to the pooled model, the total amount of land owned plays a significant role in one's ability to get formal loans. This makes sense because in the formal sector 90 percent of the loans are secured with some form of collateral and of those loans 45 percent required land as collateral. Furthermore, in the formal sector women are less likely to get a formal loan as compared to men. This seems to be true for participation in both formal or informal sectors though significant only in the formal sector. The inability of female household heads to acquire

loans is in line with recent findings. There are many reasons for this. Among them, in many societies women do not have access to titled land thereby reducing their ability to collateralize loans. Furthermore, in order to get a loan women may be required to have their male relatives guarantee the loan and men may be unwilling to do this for societal reasons (Fletcher, 2003). They also may not have similar levels of “demand” for loans. Without further analysis it is hard to pin point the exact source of bias against female headed households.

Age also seems to be significant in getting loans from the informal sector, but not in the formal sector. This may be due to the fact that the longer you live in the community the more trust and reputation you have established. Therefore, informal lenders are more likely to loan to you. In the formal sector the level of education acquired by the household head seems to significantly improve the ability to get loans. Once again, this is in accordance with the literature. Rural farmers often do not apply to loans from the formal sector because they find the loan application process intimidating and have difficulty understanding the application due to their lack of education. In addition, it may be the case that only wealthy farmers are well educated and can use their wealth as collateral thereby getting formal loans more frequently. It is interesting to note that the informal sector does not stress education as a condition for obtaining a loan whereas education increases the likelihood of securing a loan in the formal sector.

Whether or not a household has formally titled land significantly impacts the likelihood of households to get formal loans. This is not surprising, because the majority of loans dispersed in the formal sector are use land as collateral. The regional dummies seem to be insignificant in terms of increasing the likelihood of getting loans from the formal sector. Santa Barbara seems significant in terms of acquiring loans from the informal sector. The time dummies are significant; indicating that choices in the previous periods do effect current choices.

The results of the dynamic multinomial model indicate that the same variables are significant in both models. The dynamic model picks up strong regional variation. If you live in Santa Barbara or Comayagua and Yoro, you are less likely to get loans from the formal sector.

The lag state is significant which means one’s choice of previous participation strongly impacts the future participation decision. An individual with loans from the formal sector is more likely to get loans from the formal sector in the future. Further if a household has borrowed from an informal source in the past there are also more likely to secure a loan from the formal sector in the future. This re-emphasizes the findings in Section 2 that informal loans seem to be a stepping stone for many rural farmers. Having a loan from formal source in the past impacts the ability to secure a future loan in the informal sector but as pointed out in Section 2 there does not seem to be substantial movement in that direction.

Table 5. Effect of Lagged states on transition probabilities for Households with less than 10mz of land)

Final state 2000 → Initial State↓	Non Participation	Formal	Informal
Non Participation	75%	16%	9%
Formal	44%	39%	17%
Informal	58%	28%	14%
Both	37%	46%	17%

Next we turn to analyze the participation of households with less than 10 manzanas (mz.) of land. The transition probabilities presented in Tables 5 represent the mean household with less than 10 mz. of land. Further, these transition probabilities unlike ones presented in Section 2 account for unobserved heterogeneity. As pointed out before, due to the presence of unobserved individual heterogeneity the lagged state variables and random terms are not independent. The dynamic multinomial logit model with random effects yields consistent and efficient estimates. The transition probabilities are computed from the estimates as conditional probabilities – given the individual characteristics as well as lagged participation state.

Several things are worth pointing out. First, 16 percent of new entrants approach formal sector directly as compared to 9 percent in the informal sector. Second, starting with a history of loans from the formal sector helps secure a formal loan in the future for 40 percent of small farmers. Note nobody makes transition to both sectors. People either find themselves in the

formal or informal sectors. For small farmers the link between formal and informal sector seems really emphasized. Previous loans from either sector greatly increases participation in the formal sector as compared to the informal sector. This once again provides strong support to the hypothesis that at least some small farmers use informal credit as a stepping stone to formal credit. Further, previous borrowing has a definite impact on both ability to secure a loan and the ability to transition from informal to formal sector.

The next step in understanding the effects of lagged states and individual heterogeneity on the likelihood of participation in credit markets is to examine the estimated probabilities by land and wealth components. To examine this relationship more completely the predicted probabilities conditional on participation state in the previous period were plotted. Figures 1a through 1d display the magnitude of wealth bias participation choice conditional on choice in previous period. The plots have been drawn holding all values (except land) at their mean levels. While this process tends to overstate the participation of poor farmers it allows an assessment of the impact of land ownership on participation. Figure 1a shows, conditional on the participation state of the previous period, that land increases the probability of non-participation and the probability of accessing institutional credit increases. This captures two important points: first as land increases farmers may be less likely to need to loans to finance investments. Second, as land increases the probability of gaining access to formal loans increases because land may be used as collateral. Relatedly, as land increases the probability that a farmer seeks an informal loan decreases.

Plotting holding all values (except wealth) at their mean levels shows this relationship more clearly (see Figures 2a through 2d). As wealth increases the probability of participation decreases regardless of the participation choice in the previous period. Furthermore, as wealth increases the probability of participation in the formal sector increases more dramatically if a farmer has either never participated or if they have had access to institutional credit. The lower

two panels show that if a farmers history involves informal loans then the transition to formal credit increases less dramatically than starting from other states.

Section 5: Conclusions

In this paper, I have explored the question of whether state dependence and unobserved individual heterogeneity matter in rural Honduran credit markets. I have done so by studying the transition patterns among four credit market states; formal sector loans, informal sector loans, informal and formal sector loans and no loans. The main findings are that ‘true’ state dependence plays a significant role in ones ability to borrow. That is to say that the lag credit participation choice needs to enter the model in a structural way as an explanatory variable. The extent to which unobserved heterogeneity matters has been unresolved in this paper. However, further analysis is underway.

Further this paper also emphasizes the importance of time varying individual characteristics. For example, the probability of participating in the formal sector increases with education, age, sex, land size, and titling status of land owned. These same variables do not seem to impact access to informal sector credit. This is to say observed individual heterogeneity matters in case of access to formal sector loans. The simulated transition probabilities in different market conditions and for different individuals in the same period were compared. Overall transition rates to the formal sector are higher than transition rates to the informal sector. For a poor farmer with loans from the formal or informal sector increases the likelihood of securing a future formal loan by roughly 35 percent. There definitely is some upward mobility among sectors. The informal sector may serve small farmers as an important stepping-stone in terms of access to formal credit. In addition, since having secured a previous loan is an important step for future credit access especially among smaller-scale farmers, it seems that policies that promote small trial loans with low collateral and have low transaction costs but require repayment could have long run effects on credit access from other institutions.

Some limitations of my approach and directions for future research seem worth mentioning. The first is that my model uses a reduced form in the sense that loan terms and or interest rates are not explicitly modeled. An extension would be to use a more structural model in which implicit interest rates in both sectors are modeled simultaneously with credit market state. This type of model would allow me to explore how the interest rates differential between the two sectors affects participation. Another limitation of this model is the that I did not distinguish between non-participants. Clearly, making that distinction is imperative and needs further consideration.

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Appendix

A.1. Table Summary of Loan Terms by Participation State

Sector	Mean	Std. Dev.	Min	Max
Formal Loans				
Loan Size	17681	49029	120	460000
Average Loan Size	8698	30164	40	250000
Average Interest rate	9	8	0	42
Average Length of Contract	9	10	0	48
Informal Loans				
Loan Size	6677	26996	0	245000
Average Loan Size	6380	28916	0	245000
Average Interest rate	4	7	0	38
Average Length of Contract	3	10	0	58
Both Formal and Informal Loans				
Loan Size	27437	46512	500	174373
Average Loan Size	14672	25121	167	86667
Average Interest rate	8	7	0	22
Average Length of Contract	4	5	0	18

Table A.2. Type of Collateral Required by Source of Loan

Collateral type	Formal (n=316)	Informal (n=197)	Both (n=67)
Land	47%	7%	54%
Other	42%	35%	37%
None	11%	55%	9%

Table A.3. Summary of Individual Characteristics

Characteristic	Mean	Std. Dev.	Min	Max
On Farm Income Lempiras	5,846	49,110	-601,8	1,030,0
Value of Livestock	19,781	154,815	0	6,046
Off Farm Income Lempiras	1,765	12,294	0	324,000
Land Owned	23	68	0	1852
Sex of Household Head	0.84	0.58	0	1
Age of Household Head	52	28.18	0	95
Education of Household head	2.48	2.83	0	20
Number of members in the Household	7	3.55	0	55

Table. A.4. Description of the variables

Variables	Description
Own	The total amount of land owned by households in manzanas
Sometitle	Households with some land with formal title
HH_edu	Education for the household head
HH_age	Age of the household head
HH_members	Number of members in the household
T_2	Land owned squared
W_2	Wealth squared
Comay	Regional dummy for Comayagua
Yoro	Regional dummy for Yoro
Ocot	Regional dummy for Ocotopeque
Santa	Regional dummy for Santa Barbara
T1	Time dummy: 1 if year is 1984
T2	Time dummy: 1 if year is 1988
T3	Time dummy: 1 if year is 1994
Formal	Participation in the formal credit sector
Informal	Participation in the Informal credit sector
Both	Participation in both formal and informal credit sectors

Table A. 5. Static Multinomial logit Model, Year=1984

	Formal	Informal	Both
Own	0.01 (0.00)*	0.01 (0.01)	0.005 (0.01)
wealth	0.17 (0.074)*	0.53 (0.26)*	0.89 (0.47)
HH_sex	-0.84 (0.48)	0.46 (0.95)	-44.26 (0)
HH_age	-0.01 (0.01)	-0.12 (0.04)**	0.01 (0.05)
HH_edu	0.15 (0.05)**	0.06 (0.14)	0.1 (0.21)
HH_members	0.01 -0.05	0.22 -0.14	0.01 (0.19)
santa	0.35 -0.6	18.23 (2.46)**	20.5 (5.04)**
comoy	1.08 -0.59	19.78 (2.29)**	21.13 (5.10)**
yoro	1.59 (0.65)*	-25 0	-21.52 (0)
Constant	-3.65 (0.99)**	-23.98 0	-34.01 (0)
Observations	407	407	407

Standard errors in parentheses

* significant at 5%; ** significant at 1%

Table A. 6. Pooled Multinomial Logit Model Coefficient estimates

	Formal	Informal	Both
Own	0.004 (0.002)*	-0.0017 (0.005)	0.01 (0.003)**
wealth	2.67e-06 (2.09e-6)	-1.60e-06 (0.00001)	2.02e-06 (2.55e-06)
HH_sex	-1.13 (0.30)**	-0.39 (0.46)	-0.46 (0.74)
HH_age	0.0037 (-0.006)	-0.03 (0.01)**	0.01 (0.02)
HH_edu	0.17 (0.04)**	0.11 (0.06)	0.27 (0.06)**
HH_members	0.08 (0.03)**	0.07 (0.04)	0.14 (0.07)*
Sometitle	2.14 (0.35)**	0.33 (0.34)	24.21 (1.51)**
santa	-0.4 (0.29)	-0.89 (0.44)*	-1 (0.52)
comoy	0.21 (0.29)	-0.3 (0.4)	-1.32 (0.55)*
yoroy	0.16 (0.37)	0.34 (0.48)	-1.72 (1.17)
T1	-29.67 (1.11)**	-30.47 (1.06)**	-32.09 (1.22)**
T2	-29.26 (1.11)**	-31.95 0	-70.89 (37.12)
T3	-28.87 (1.11)**	-28.63 (1.05)**	-31.09 (1.21)**
Constant	24.96 (1.25)**	27.97 (1.32)**	2.24 0
Observations	1183	1183	1183

Standard errors in parentheses

* significant at 5%; ** significant at 1%

Table A.7. Dynamic Multinomial Logit Coefficient Estimates

	Formal	Informal	Both
Constant	-4.155 (0.764)**	-0.697 (0.929)	-26.031 (1.205)**
Own	0.0002 (0.004)	-0.014 (0.011)	0.04 (0.015)**
wealth	0.000006 (0.00001)	0.000040 (0.00003)	0.000009 0
T_2	0	0.000024 (0.00003)	-0.000187 (0.000)*
W_2	0	0	0.000000 (0.000)
HH_sex	-1.382 (0.418)**	-0.96 (0.544)	-0.368 (0.733)
HH_age	0.015 (0.009)	-0.019 (0.012)	0.011 (0.017)
HH_edu	0.206 (0.051)**	0.104 (0.076)	0.411 (0.075)**
HH_members	0.163 (0.038)**	0.081 (0.051)	0.392 (0.077)**
Sometit	1.961 (0.348)**	-0.099 (0.333)	20.49 0
santa	-1.467 (0.388)**	-1.31 (0.491)**	-3.014 (0.606)**
comoy	-1.067 (0.360)**	-1.478 (0.447)**	-4.073 (0.635)**
yoro	-1.546 (0.500)**	-0.673 (0.502)	-4.428 (1.247)**
Formal	1.544 (0.254)**	0.856 (0.388)*	2.075 (0.479)**
Informal	0.954 (0.574)	0.579 (0.852)	0.899 (1.153)
Both	-0.254 (1.49)	-29.977 (38.405)	-2.47 (2.259)

Observations

Standard errors in parentheses

* significant at 5%; ** significant at 1%

