

# **Poverty, Structural Transformation, and Land Use in El Salvador: Learning from Household Panel Data**

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## **Abstract**

Using data collected in four biennial surveys of a nationally representative sample of rural households in El Salvador, we examine trends in structural transformation and living standards. Per capita income grows the fastest for households that diversify away from agriculture. To analyze factors influencing this diversification, a multinomial probit model is estimated. In addition, we find farmed area increasing even for households experiencing a rise in non-agricultural earnings. This suggests that a precautionary demand for resources suitable for subsistence farming remains strong in places like the Salvadoran countryside, in spite of non-agricultural growth and improved living standards.

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# Poverty, Structural Transformation, and Land Use in El Salvador: Learning from Household Panel Data

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## Introduction

El Salvador may seem an unusual setting for the study of agriculture's expansion at the expense of natural habitats. It is the most densely populated nation on the American mainland, and there are few places where cumulative deforestation is as far advanced. Nevertheless, Salvadoran farmers are constantly clearing new land, more often than not in places with severe erosion and environmental risks (Panayotou, Faris, and Restrepo).

The impetus for agricultural extensification does not come from incentives for commodity production that are highly favorable. To the contrary, a currency strengthened by remittances sent home by Salvadoran migrants in the United States and elsewhere encourages imports and discourages exports of agricultural products. Moreover, the price of coffee, which has been the country's main export crop for more than a century, dropped from \$2.00/pound in early 1998 to a low of \$0.50/pound in 2001. Furthermore, rural areas are still recovering from the loss of infrastructure and entrepreneurial talent during the civil war of the 1980s.

As incentives for agriculture have weakened, economic opportunities outside of farming have been improving for a number of rural households. All the more reason, one might suppose, for cultivated area to hold steady or decline, not to increase. Addressing this apparent paradox, Rodríguez-Meza, Southgate, and González-Vega suggest that poor or nearly-poor households, which are the vast majority in the Salvadoran countryside, have a **precautionary demand** for land that can be used for subsistence agriculture.

This precautionary demand arises because institutional rigidities and policy-induced distortions in land and financial markets foreclose options for the smoothing of income and consumption, in the face of frequent earnings shortfalls caused by poor weather or deteriorating terms of trade. Insurance is non-existent, while limited opportunities exist for diversification as a means to deal with risk. While the precautionary demand for subsistence farmland declines as living standards rise, a household's ability to acquire this resource – at a cost – goes up with its per capita earnings. From this analysis of precautionary demand, Rodríguez-Meza, Southgate, and González-Vega derived a rationale for an Environmental Kuznets Curve (EKC) that relates agricultural land use at the household level to income per capita. These authors estimate the curve using a set of panel data collected in four biennial surveys of a nationally representative sample of rural households in El Salvador.

The surveys were implemented jointly by the Fundación Salvadoreña para el Desarrollo Económico y Social and The Ohio State University. The years covered are 1995, when conditions for crop production were generally favorable; 1997, when coffee prices were high but much of the country suffered drought due to the *El Niño* phenomenon; 1999, when production conditions were normal but coffee prices were sliding; and 2001, when Salvadoran agriculture suffered from low coffee prices as well as dry conditions and two major earthquakes. While the authors find statistical evidence for the existence of an EKC, they also report that 90 percent of the sample earned per capita incomes below the curve's peak, the threshold at which improved living standards start coinciding with diminished farm area and less pressure on the environment at the household level.

This paper draws on the same set of panel data. To begin, we use the data to describe how some households have raised living standards, usually by diversifying away from agriculture. In contrast, households that depend primarily on agriculture, either because they farm or because wages on other people's farms comprise a large part of their income, tend to be mired in poverty. Descriptive statistics and econometric analysis are used to identify household characteristics related to income growth and diversification away from agriculture.

Significantly, we do not find that improved living standards –or even increased non-agricultural earnings– are always associated with diminished agricultural land use at the household level. That an opposite relationship holds for much of the rural population suggests that the primary impact of income growth is to relax budget constraints that limit a household's ability to act on its precautionary demand for subsistence farmland.

### **Income Trends and Poverty**

Notwithstanding compounding shocks from droughts, earthquakes, hurricanes, and falling commodity prices, per capita income within our sample increased steadily, on average by 5 percent (1995-97), 48 percent (1997-99), and 13 percent (1999-2001). Rural income per capita was \$ 788 by 2001, compared to \$ 452 in 1995 (in 1999 dollars). The general trend did not translate, however, into income increases for all. Indeed, 52 percent of the households interviewed in 1997 had lower incomes than in 1995. Likewise, one-third suffered a reduction in income during the next biennium, and 42 percent had lower incomes in 2001 than in 1999.

As a result of considerable income volatility, households have risen out of poverty in some years and experienced hard times in other years. Between 1995 and 1997, the incidence of extreme poverty, which is measured using a standard that accounts for the earnings needed for minimally adequate calorie intake, rose from 39 to 44 percent of the households. Meanwhile, the portion of households below the relative poverty line, which is double the standard for extreme poverty, remained at 71 percent (table 1). In reflection of strong income growth after 1997, the incidence of extreme and relative poverty had fallen to 17 and 43 percent, respectively, by 2001.

Much mobility within the income distribution was also observed. In each survey, only 18 percent of the households remained in the same decile as in the prior period. A household's location has been more stable at the extremes of the distribution, and there is evidence of possible poverty traps for households with very low incomes (Rodríguez-Meza and González-Vega).

### *Routes to diversification*

The main engines of income growth are self-employment in microenterprises as well as remittances from migrants; in contrast, agricultural wage earnings decline and there is only modest growth in income from farming. Another way for some households to avoid poverty and low farm earnings and to cope with both idiosyncratic and systemic risks—resulting from market and environmental shocks—is to find local employment in non-agricultural occupations.

Barriers exist to all these routes to diversification. Educational credentials are required for non-agricultural jobs, while access to infrastructure facilitates off-farm employment and benefits small businesses. In addition, diversifying without relocating does not eliminate the income volatility typical of communities in which many people farm. Indeed, the earnings of microenterprises offering services in rural settings are covariant with agricultural incomes. International remittances are much less covariant with local incomes, agricultural as well as non-agricultural (Pleitez-Chávez). However, this approach to diversification involves the cost of sending a household member to the United States. Finally, subsistence crop production remains the contingent option for many households, including though not limited to those finding it hard to secure non-agricultural jobs, start microenterprises, or send offspring abroad.

### *Household categories*

To understand linkages among poverty and integration to markets as well as implications for land use, households in the panel are classified each year according to the sector that generates the greatest share of their income. Three of the categories are related to agriculture: (a) subsistence farmers, (b) commercial farmers, who sell most of their—frequently small—output, and (c) agricultural wage earners. Three additional categories are (d) other households, which subsist on earnings from assets and remittances or for which no single source of income accounts for more than 50 percent of total earnings, (e) non-agricultural wage earners, and (f) microentrepreneurs.

For more than half the panel, household income is earned mainly in agricultural or non-agricultural labor markets (table 1). Farm production is also important, but the number of commercial and subsistence farmers declined steadily in the last three surveys. In contrast, the number of microentrepreneurs increased. In turn, the drop in the number of non-agricultural wage earners is mostly explained by attrition between 1995 and 1997.

Attrition is highly concentrated in households with little or no linkages to land and thus a greater tendency to migrate, while income and attrition are not endogenously determined (Rodríguez-Meza and González-Vega).

Agriculture is a weak basis for income generation in El Salvador. The per capita incomes of commercial and subsistence farmers and agricultural wage earners are below the median for the panel (table 1). In contrast, households that generate most of their incomes from employment outside of farming or from microenterprises enjoy per capita incomes above the median. The importance of remittances is shown in table 1 in two ways: as the proportion of households that receive transfers from abroad and as remittances per capita. Both indicators rise between 1995 and 2001, but there is considerable variation among categories. Wage earners are less dependent on remittances than the self-employed (commercial and subsistence farmers as well as microentrepreneurs). This suggests some substitution between participation in local labor markets versus migration-cum-remittances as paths for escaping low-productivity agriculture. Households choosing not to have migrants or not able to afford the related expenses allocate a significant portion of their labor force to waged local employment. For microentrepreneurs, the initially sizable flow of remittances may have been the source of the investment needed to start small businesses, a possibility that contradicts beliefs that remittances are not invested (Chami, Fullenkamp, and Jahjah). For agricultural wage earners, the compound effects of low locally-generated income and low frequency and low levels of remittances translate into a higher incidence of poverty (table 1). The incidence of poverty is lower among subsistence and commercial farmers, but only thanks to hefty remittances and not to their ability to generate local income. In contrast, the incidence of poverty among microentrepreneurs and non-agricultural wage earners is consistently lower than among the rural population at large.

The panel data make it possible to show how linkages between diversification and income growth are associated with shifts of some households across categories over time. There are fewer agriculturally-dependent households at the end of the period than six years earlier. Between 1995 and 2001, the proportion of agricultural wage earners in the sample declined from 39 to 18 percent and the proportion of commercial farmers declined from 16 to 14 percent, while the proportion of microentrepreneurs increased from 2 to 16 percent.

#### *Changes in land use*

There have been interesting shifts in land use at the household level as well (table 1). After going up from 1995 to 1997 (when coffee prices were rising), the number of commercial farmers and the median land area they cultivated subsequently declined, as did their share in the total area cultivated by all household categories the panel, from 64 percent in 1995 to 32 percent in 2001. These trends reflect declining incentives for using land for commercial purposes. The median area of cultivated land also declined for subsistence farmers.

In contrast, the proportion of agricultural wage earners that cultivate land rapidly increased. As their employment opportunities and income per capita declined, they relied on their own cultivation to smooth consumption. Moreover, having land that can be used for subsistence production (a precautionary demand) also appears to be desirable for the two non-agricultural categories —wage earners and microentrepreneurs. For each of these categories, the proportion of households that raised crops, mostly for home consumption, also rapidly increased between 1995 and 2001. For them, increasing incomes released binding wealth constraints on the exercise of their precautionary demand for land. As a result, between 1995 and 2001, the share in all the cultivated area for the panel increased from 2 to 17 percent for microentrepreneurs and from 16 to 22 percent for non-agricultural wage earners.

The precautionary demand for agricultural land is thus substantial in rural El Salvador. Income volatility is significant for just about everyone, the only exceptions being households with sizable remittances. In turn, income growth enables poor or nearly poor households to acquire more land, which helps explain why the portion of microentrepreneurs that cultivate land has gone up over time. Continued farming is accentuated by a desire to insure against the risks of starting a new line of work.

### **Model and Estimation Results**

A probabilistic choice model was estimated to explain the probability of being in a particular income-earning category, as a function of household characteristics, including resource endowments, access to markets, diversification opportunities, and demographic features and preferences:

$$(1) \quad P(y_{it} = j / x_{it}, c_i) = f(x_{it}, c_i, \beta) \quad j=1, \dots, 6$$

where  $j$  is the household category and  $\beta$  are the parameters to be estimated. The probability of a household being in a given category in any given year ( $y_{it}$ ) is determined by observable attributes that vary across households and over time, ( $x_{it}$ ) and unobservable time-invariant household attributes ( $c_i$ ). The use of panel data makes it possible to account for unobserved heterogeneity across households,  $c_i$ , thereby eliminating potential distorting effects on the estimates of the parameters for observed variables. Since the model implicitly deals with occupational choice, unobserved household heterogeneity includes key determinants of this choice, such as risk aversion and entrepreneurship, as well as preferences between rural and non-rural environments and between national and international migration.

We have assumed a latent ordering of the categories in acknowledgement of various income-generating and risk-coping abilities, as reflected by the data in table 1. The latent ordering,  $y_{it}^*$ , is approximated by the artificially-created variable,  $y_{it}$ , which is a discrete proxy for the intervals where the unique latent continuous random variable  $y_{it}^*$  may fall.

The variable  $y_{it}$  reflects the latent ordering as revealed by the average of the median income per capita for each category. The resulting ordering is consistent with observed trends in income growth and household shifts across categories: at the bottom are subsistence farmers, followed by commercial farmers, agricultural wage earners, other households, non-agricultural wage earners, and microentrepreneurs. While we have created the ordering ourselves, it actually reflects well-recognized stylized facts about the Salvadoran rural areas.

The model was estimated as a multinomial ordered probit. This is equivalent to assuming that the errors in the latent response functions are multivariate normally distributed. Arbitrary correlation in the choice among alternatives may thus emerge. Following Chamberlain and as suggested by Wooldridge, given the explanatory variables, unobserved heterogeneity is assumed to be normally distributed with linear expectation and constant variance independent of the explanatory variables. That is:

$$(2) \quad c_i = \psi + \bar{X}_i \delta + a_i \text{ with } a_i / x_i \sim N(0, \sigma_a^2)$$

The model to estimate thus becomes:

$$(3) \quad P(y_{it} = j / x_{it}, c_i) = f(x_{it}, \bar{x}_i, e_{it} + a_i) \quad j=1, \dots, 6$$

This transformed functional form meets all the assumptions necessary for a random-effects ordered probit estimation. Consequently, marginal effects, averaged over the distribution of the unobserved heterogeneity, can be consistently estimated from a pooled multinomial ordered probit (Wooldridge).

The explanatory variables used in the estimation included proxies for the household's resource endowment: the quality (schooling) and quantity of its labor force, area of cultivated land, cropland, assets, and value of livestock. Distance to the nearest paved road reflects opportunities for integration to markets. Other variables are proxies for diversification: the shares of the household's labor supply allocated to off-farm jobs – both agricultural and non-agricultural– and to microenterprises as well as the number of crops cultivated. Proxies for risk-mitigating mechanisms are access to formal credit and remittances, while dummies for each year capture systemic shocks. The marginal effects of changes in the explanatory variables are shown in table 2, computed at the sample medians.

Human capital matters. A larger and more educated household labor supply facilitates diversification. The number of household members who work has a positive and significant effect on the probability of belonging to a non-agricultural category (microenterprises and wage earners), while its effect on the probability of being in agriculture is negative.

Moving away from the median, each additional worker increases the probability of being a microenterprise by one percentage point and of being a non-agricultural wage earner by three percentage points, while it reduces the probability of being a commercial farmer by two percentage points. Even though the coefficient is not statistically significant, the sign for the schooling of the labor force suggests a similar influence.

Specific asset endowments are also associated with household type. The signs of the marginal effects are the same for the three classes of assets, namely cropland, household assets, and livestock. Their association with the probability of being related to agriculture is positive, while their influence on the probability of belonging to non-farming categories is negative. The coefficient for household assets, however, is not significant. Commercial farmers and agricultural wage earners are the group most sensitive to the influence of cropland area. Distance to the nearest paved road, a proxy for access to markets and transaction costs, has a positive effect on being in a non-agricultural category, but the marginal effect is not significant.

The allocation of the labor force to off-farm and on-farm occupations is statistically significant in defining household categories. An increase in the share of off-farm workers—both in and outside agriculture—reduces the probability of belonging to an agricultural category, particularly commercial farming, while it increases the probability of being a non-agricultural household, with the strongest effect on non-agricultural wage earners. Households with a lower proportion of the labor force working off the farm have a lower probability of being non-agricultural wage earners.

Similarly, a larger share of the labor force allocated to microenterprises increases the probability of moving away from dependence on agriculture. In turn, crop diversification is not only a costly income-smoothing strategy; it also significantly increases the probability that a household belongs to an agricultural category. Larger formal loans increase the probability of being a non-agricultural household, which may require a larger investment, and reduce the probability of being in agriculture. The parameter for remittances is not statistically significant. Finally, the dummy variables are all statistically significant. For the years 1995 and 1997, the likelihood of being an agriculturally-related household is higher, compared to 2001, which increases the chances of moving to non-agricultural categories, possibly in response to the severe drought and deterioration of the terms of trade of agriculture.

The use of panel data has facilitated our understanding of the complex process of structural transformation that is occurring in the rural areas of El Salvador. The implications of this transformation on resource degradation must be further investigated. Our data suggest that even households that shift from agricultural to non-agricultural activities keep demanding land for precautionary purposes, with a portion of additional income used to enlarge the area under cultivation for the purpose of consumption smoothing.

More productive land is used first, with marginal and environmentally-fragile land used when households have to address income shocks (Maldonado). Moreover, the poorest households cultivate the most eroded hillsides, which suggests a direct relationship between poverty and resource degradation and even poverty traps at very low levels of income. If resources are being degraded, as households act on their precautionary demand for farmland, the main impact may not be at the level of individual farms; instead, these effects make take most of their toll in lower watersheds, in the form of increased flooding and sedimentation. If spillovers of this kind are a primary concern, then there is a social interest in alternative mechanisms that allow households threatened by poverty to raise and diversify their incomes and smooth their consumption, rather than resorting to subsistence farming in fragile hillside plots.

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**Table 1. Income, Incidence of Poverty, and Agricultural Land Use by Household Category**

| Type of household         | Year | Number of households | Median non-remittance income per capita<br>(US\$ of 1999) | Households with remittances<br>(%) | Median remittances per capita<br>(US\$ of 1999) | Median combined income per capita<br>(US\$ of 1999) | Households below relative poverty line<br>(%) | Households that cultivate land<br>(%) | Median farmed area<br>(ha) |
|---------------------------|------|----------------------|---|------------------------------------|---|---|---|---------------------------------------|----------------------------|
| Subsistence farmers       | 1995 | 7                    | 74  | 14                                 | 158   | 74  | 100   | 100                                   | 1.35                       |
|                           | 1997 | 34                   | 106   | 38                                 | 135   | 167   | 79  | 100                                   | 1.31                       |
|                           | 1999 | 29                   | 342   | 55                                 | 188   | 743   | 48  | 100                                   | 1.00                       |
|                           | 2001 | 25                   | 230   | 76                                 | 611   | 800   | 32  | 100                                   | 1.02                       |
| Commercial farmers        | 1995 | 102                  | 154   | 39                                 | 150   | 254   | 70  | 96                                    | 1.73                       |
|                           | 1997 | 100                  | 175   | 32                                 | 113   | 247   | 81  | 82                                    | 2.26                       |
|                           | 1999 | 80                   | 242   | 53                                 | 273   | 473   | 50  | 88                                    | 1.78                       |
|                           | 2001 | 61                   | 243   | 59                                 | 216   | 496   | 46  | 89                                    | 1.72                       |
| Agricultural wage earners | 1995 | 242                  | 221   | 17                                 | 105   | 238   | 88  | 12                                    | 0.91                       |
|                           | 1997 | 129                  | 187   | 17                                 | 96  | 204   | 91  | 37                                    | 0.86                       |
|                           | 1999 | 103                  | 208   | 32                                 | 37  | 276   | 81  | 57                                    | 0.82                       |
|                           | 2001 | 83                   | 298   | 30                                 | 113   | 341   | 66  | 63                                    | 0.67                       |

**Table 1. Continued**

| Type of household             | Year | Number of households | Median non-remittance income per capita<br>(US\$ of 1999) | Households with remittances<br>(%) | Median remittances per capita<br>(US\$ of 1999) | Median combined income per capita<br>(US\$ of 1999) | Households below relative poverty line<br>(%) | Households that cultivate land<br>(%) | Median farmed area<br>(ha) |
|-------------------------------|------|----------------------|---|------------------------------------|---|---|---|---------------------------------------|----------------------------|
| Others                        | 1995 | 20                   | 343   | 20                                 | 577   | 560   | 50  | 50                                    | 1.01                       |
|                               | 1997 | 27                   | 182   | 41                                 | 213   | 213   | 70  | 63                                    | 1.34                       |
|                               | 1999 | 37                   | 257   | 49                                 | 238   | 366   | 57  | 51                                    | 1.14                       |
|                               | 2001 | 40                   | 364   | 60                                 | 141   | 539   | 40  | 58                                    | 1.06                       |
| Non-agricultural wage earners | 1995 | 240                  | 461   | 15                                 | 101   | 472   | 56  | 15                                    | 1.12                       |
|                               | 1997 | 152                  | 430   | 21                                 | 41  | 490   | 55  | 38                                    | 0.89                       |
|                               | 1999 | 163                  | 507   | 31                                 | 110   | 565   | 43  | 51                                    | 0.73                       |
|                               | 2001 | 168                  | 560   | 43                                 | 86  | 649   | 36  | 55                                    | 0.68                       |
| Micro-enterprises             | 1995 | 17                   | 273   | 24                                 | 420   | 309   | 59  | 35                                    | 0.98                       |
|                               | 1997 | 51                   | 437   | 22                                 | 155   | 545   | 49  | 37                                    | 1.00                       |
|                               | 1999 | 57                   | 852   | 39                                 | 136   | 914   | 25  | 54                                    | 1.37                       |
|                               | 2001 | 73                   | 551   | 45                                 | 277   | 620   | 36  | 58                                    | 1.14                       |
| Entire Panel                  | 1995 | 628                  | 293   | 20                                 | 122   | 324   | 71  | 30                                    | 1.41                       |
|                               | 1997 | 493                  | 275   | 25                                 | 103   | 308   | 71  | 52                                    | 1.41                       |
|                               | 1999 | 469                  | 364   | 39                                 | 142   | 467   | 52  | 62                                    | 1.12                       |
|                               | 2001 | 450                  | 405   | 47                                 | 181   | 547   | 43  | 64                                    | 1.00                       |

Note: Median remittances per capita in any given year have been calculated only for those households receiving remittances the same year. Likewise, median farmed area in any given year has been calculated only for households that cultivated land that same year.

**Table 2. Marginal effects on the probability of being in a given category from a random effects ordered probit estimation**

| Variable                                  | Median | Marginal effects at median |                            |                    |                        |                            |                             |
|---|--------|----------------------------|----------------------------|--------------------|------------------------|----------------------------|-----------------------------|
|   |        | Micro-<br>enter-<br>prises | Non-ag.<br>wage<br>earners | Others             | Ag.<br>wage<br>earners | Com-<br>mercial<br>farmers | Sub-<br>sistence<br>farmers |
| Labor force numbers                       | 4      | 0.01 <sup>a</sup>          | 0.03 <sup>a</sup>          | 0.00 <sup>c</sup>  | -0.01 <sup>a</sup>     | -0.02 <sup>a</sup>         | -0.00 <sup>a</sup>          |
| Workers' average schooling                | 3.2    | 0.00                       | 0.00                       | 0.00               | -0.00                  | -0.00                      | -0.00                       |
| Cropland area (ha)                        | 0.02   | -0.01 <sup>a</sup>         | -0.03 <sup>a</sup>         | -0.00 <sup>c</sup> | 0.02 <sup>a</sup>      | 0.02 <sup>a</sup>          | 0.01 <sup>a</sup>           |
| Home assets index                         | 4      | -0.00                      | -0.00                      | -0.00              | 0.00                   | 0.00                       | 0.00                        |
| Livestock value                           | 0      | -0.00 <sup>a</sup>         | -0.00 <sup>a</sup>         | -0.00 <sup>b</sup> | 0.00 <sup>a</sup>      | 0.00 <sup>a</sup>          | 0.00 <sup>a</sup>           |
| Distance to road (hours)                  | 0.33   | 0.00                       | 0.01                       | 0.00               | -0.00                  | -0.01                      | -0.00                       |
| Wage earners outside household (%)        | 0.33   | 0.08 <sup>a</sup>          | 0.25 <sup>a</sup>          | 0.01 <sup>b</sup>  | -0.11 <sup>a</sup>     | -0.19 <sup>a</sup>         | -0.04 <sup>a</sup>          |
| Agricultural workers inside household (%) | 0.4    | -0.04 <sup>a</sup>         | -0.12 <sup>a</sup>         | -0.00 <sup>b</sup> | 0.06 <sup>a</sup>      | 0.09 <sup>a</sup>          | 0.02 <sup>a</sup>           |
| Microenterprise workers inside (%)        | 0      | 0.10 <sup>a</sup>          | 0.29 <sup>a</sup>          | 0.01 <sup>b</sup>  | -0.14 <sup>a</sup>     | -0.22 <sup>a</sup>         | -0.05 <sup>a</sup>          |
| Number of crops                           | 1      | -0.01 <sup>b</sup>         | -0.02 <sup>b</sup>         | -0.00              | 0.01 <sup>b</sup>      | 0.01 <sup>b</sup>          | 0.00 <sup>b</sup>           |
| Formal credit amount                      | 0      | 0.00 <sup>b</sup>          | 0.00 <sup>b</sup>          | 0.00               | -0.00 <sup>c</sup>     | -0.00 <sup>b</sup>         | -0.00 <sup>c</sup>          |
| Remittances per capita                    | 0      | -0.00                      | -0.01                      | -0.00              | 0.00                   | 0.00                       | 0.00                        |
| Dummy year 1995                           | -      | -0.02 <sup>b</sup>         | -0.06 <sup>a</sup>         | -0.00 <sup>b</sup> | 0.02 <sup>b</sup>      | 0.05 <sup>a</sup>          | 0.01 <sup>b</sup>           |
| Dummy year 1997                           | -      | -0.01 <sup>b</sup>         | -0.04 <sup>b</sup>         | -0.00 <sup>c</sup> | 0.02 <sup>b</sup>      | 0.04 <sup>b</sup>          | 0.01 <sup>b</sup>           |
| Dummy year 2001                           | -      | 0.03 <sup>a</sup>          | 0.07 <sup>a</sup>          | 0.00               | -0.04 <sup>a</sup>     | -0.05 <sup>a</sup>         | -0.01 <sup>a</sup>          |
| Prob ( $y_{it} = j$ )                     |        | 0.049                      | 0.355                      | 0.081              | 0.333                  | 0.164                      | 0.018                       |

Note: Total number of observation is 1,893. Pseudo R-squared is 0.1403, and the p-value of the likelihood ratio test is 0.0000. Livestock value and amount of formal credit are measured in thousands of constant colones of 1999. Remittances are measured in constant US dollars of 1999.

<sup>a</sup> Significant at 1%.

<sup>b</sup> Significant at 5%.

<sup>c</sup> Significant at 10%.