

Poverty dynamics in Costa Rica with panel data from cross-sections

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An analysis of the dynamics of poverty requires longitudinal data. In Costa Rica, as in most Latin American countries, such data are unavailable. In order to examine the dynamic aspects of poverty, this article uses cross-sectional information to develop a set of panel data. Given a stable macroeconomic environment and a constant poverty rate, these data show that the poor households studied over a three-year period were not always made up of the same units, as significant turnover rates were found to exist between the poor and the non-poor.

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I

Introduction

In order to study the dynamics of poverty, this article employs a methodology which uses observations from a cross-sectional survey to build a set of panel data. The successive samples of this survey are not independent.

The effort to combat poverty in Latin America between 1999 and 2002 was marked by a stalled poverty rate (ECLAC, 2004). Costa Rica was no exception; for almost a decade, beginning in 1994, the poverty rate held more or less steady at around 20% of households. In addition to a flat poverty rate, GDP growth between 2000 and 2002 was 1.8%, 1.0% and 2.9% – relatively stable figures – and inflation remained relatively steady as well, at 10.25%, 10.96% and 9.68%. This raises a number of questions. To what extent do poor households in Costa Rica consistently correspond to the same units? Is there a turnover rate between the poor and the non-poor, characterized by an underlying stratum of chronically poor households? And if so, what is the level of this turnover rate, what is the magnitude of chronic poverty, and what are the main determining factors in each case?

The study of the dynamics of poverty focuses on the evolution of poverty over time. Typical issues in

this field include the nature and determinants of changes in the poverty status of households over time, or the duration of poor or non-poor spells among the individuals who comprise a social cluster. This approach to the study of poverty has produced original concepts and terms, such as: “transitions”, “chronic poverty”, “transitory poverty”, “persistent poverty”, “occasional poverty” and “poverty spells”. A “transition” is a change in the poverty status of a household or an individual. “Chronic poverty” occurs when a household or individual remains poor for a period equal to or greater than an arbitrarily established benchmark value. “Transitory poverty” is a state of poverty in which a transition to non-poor status is experienced within a relatively short period of time. “Occasional poverty” is defined as poverty which occurs episodically within a given time frame. A “poverty spell” can be defined as poverty experienced during a given period of time.

The purpose of this article is to analyse certain aspects of the dynamics of poverty in Costa Rica, while also disseminating a methodological alternative for the development of the panel data set needed to achieve that objective, using information gathered through a cross-sectional survey.

II

The dynamic approach to poverty analysis

Dynamic analyses focus on the evolution of variables over time. In the case of poverty, such analyses study trends in the poverty status (poor or non-poor) of each individual or household comprising a population over a given time period.

Data on the evolution of the poverty status of a group of individuals or households can be used to generate information on the flows of variables that account for net changes in the pool of variables usually employed to characterize poverty at a given point in

time. Consequently, while a static analysis provides information on the number of poor individuals at two successive moments in time, a dynamic analysis explains how one situation evolved into another and indicates how many persons remained poor after the change, how many exited poverty, how many were non-poor and entered poverty, and how many were non-poor at both points in time.

Dynamic studies of poverty seek not only to quantify the explanatory flows of changes in variable pools, but also to determine their possible causes. Consequently, the databases used by such studies are not limited to poverty status, but also include other socio-economic and demographic variables, measured

□ This article is based on the research of Slon and Zúñiga (2004).

at successive points in time –for example, age, sex, relationship to the head of household, schooling or education, type of economic activity and income.

A dynamic analysis of poverty therefore requires a set of observations regarding a certain number of variables, for the same group of individuals, at two or more points in time. Such data sets are known as panel data, or simply as panels.

The observations that make up a panel are of the X_{ijt} type, where i represents a variable or characteristic, such as the number of individuals in a household, monthly income, or some other item ($i = 1, 2, 3, \dots, K$), j represents a unit of analysis, such as a household, an individual, or some other item ($j = 1, 2, 3 \dots N$), and t represents the period covered by the information ($t = 1, 2, 3, \dots, T$). In panel terminology, every data set that matches one of the T moments which make up a panel is known as a “wave”. Each wave of the panel is a cross-section.

According to Deaton (1997), Baltagi (1995), and Buck, Ermisch and Jenkins (1995), the advantages of panel data include their ability to show changes in the magnitudes displayed by individual households in a survey, as well as the greater accuracy they provide when estimates of aggregate quantities or averages are required. Disadvantages cited by these authors include the fact that, for whatever reason, some households are lost from a survey as time goes by. This phenomenon is known as “attrition”. Panel design, the ability or failure to follow up on individuals who leave their original household or move out of the original survey area, and non-response all play a role in this regard.¹ Furthermore, panel data involve short time series which may be prone to bias (due to attrition and the small size of sub-groups after attrition), which lose members to the general population and which are more sensitive to the response margin.

Longitudinal surveys spanning long periods of time are conducted in some developed countries. These surveys are specifically designed to obtain panel data for the study of socio-economic phenomena. One such survey is the Panel Study of Income Dynamics (PSID), conducted by the Survey Research Centre of the University of Michigan (United States). According to Baltagi (1995), this survey began in 1968 with 4,802 families.

According to Deaton (1997), however, panel surveys in general are rare, particularly in developing countries. The dynamics of poverty in these countries

have been studied using data from short-term panels, with small samples or samples constructed by reconciling cross-sectional survey data through one or another method for the identification of recurrently selected individuals or households.²

The dynamics of poverty can be analysed using several different types of tabulations derived from panel data. One such method uses transition matrices. These are square matrices consisting of rows, which represent the possible categories or ranges of variation of a variable or feature of interest over a given period of time, and columns, which represent these same categories or ranges of variation, in the same order, at a later period. Thus, the components of the matrix represent the number of cases or percentages of a population that have experienced change between one period and the next.

If a stationary population³ is classified according to the evolution of the poverty status of its households, as follows:

Π_{pp} = number of households that are poor at $t = 0$ and $t = 1$

Π_{pn} = number of households that are poor at $t = 0$ and non-poor at $t = 1$

Π_{np} = number of households that are non-poor at $t = 0$ and poor at $t = 1$

Π_{nn} = number of households that are non-poor at $t = 0$ and $t = 1$

then the following table can be constructed:

TABLE 1

Transitions in the poverty status of households between $t = 0$ and $t = 1$

Poverty status at $t = 0$	Poverty status at $t = 1$		
	Poor	Non-poor	Total
Poor	Π_{pp}	Π_{pn}	P_0
Non-poor	Π_{np}	Π_{nn}	N_0
Total	P_1	N_1	Π

Source: Data compiled by the authors.

In the table shown above, P_1 represents the total number of households that were poor at $t = 1$; N_1 represents the total number of households that were

¹ Roberts (2000) explains attrition in similar terms.

² In Latin America, the work of Herrera (2001) and Paz (2002) should be noted in this regard.

³ A population is said to be stationary if it consists of a group of units of analysis whose composition does not change over time.

non-poor at $t = 1$; and P represents the overall number of households.

The fields containing the terms Π_{pp} , Π_{pn} , Π_{np} and Π_{nn} , in the shaded section of the table, constitute the transition matrix of poverty between time points $t = 0$ and $t = 1$. A poverty transition matrix shows the number of households that have been poor and non-poor in each period, as well as the number of households that have exited and entered poverty. The elements inside the main diagonal pertain to households that remain poor, while those outside show the number of households that have migrated from one status to another.

These transition matrices are usually presented in relative terms, so that percentages can be assigned to their components. Thus, for example, each one of the Π_{pp} , Π_{pn} , Π_{np} and Π_{nn} components of the matrix shown above can be divided by Π to determine the share of each one of the four possible types of transition. If the results are represented as π_{pp} , π_{pn} , π_{np} and π_{nn} , respectively, the transition matrix, in relative terms, would be as follows:

TABLE 2
Transitions in the poverty status
of households between $t = 0$ and $t = 1$

Poverty status at $t = 0$	Poverty status at $t = 1$		
	Poor	Non-poor	Total
Poor	π_{pp}	π_{pn}	H_0
Non-poor	π_{np}	π_{nn}	$1 - H_0$
Total	H_1	$1 - H_1$	1

H_0 and H_1 represent poverty rate indices⁴ at $t = 0$ and $t = 1$, respectively, since $H_0 = P_0/\Pi$ and $H_1 = P_1/\Pi$.

One common variation in such transition matrices is to present them in relative terms, but in such a way as to match the elements in the first row with the percentages observed in poor households at $t = 0$, depending on whether they were poor or non-poor at $t = 1$, and those in the second row with the percentages observed in non-poor households at $t = 0$, depending on whether they were poor or non-poor at $t = 1$. The following definitions can then be formulated:

Hence, λ_{pp} is the proportion of poor households at $t = 0$ that remain poor at $t = 1$, λ_{pn} is the proportion of poor households at $t = 0$ that are non-poor at $t = 1$, λ_{np}

is the proportion of non-poor households at $t = 0$ that are poor at $t = 1$, and λ_{nn} is the proportion of non-poor households at $t = 0$ that are non-poor at $t = 1$.

The transition matrix can then be reformulated as shown in table 3.

TABLE 3
Transitions in the poverty status
of households between $t = 0$ and $t = 1$

Poverty status at $t = 0$	Poverty status at $t = 1$		
	Poor	Non-poor	Total
Poor	λ_{pp}	λ_{pn}	1
Non-poor	λ_{np}	λ_{nn}	1

In the matrix shown above, λ_{pn} represents what is usually referred to as the poverty exit rate, which may be understood as the (conditional) probability that a household may not be poor in one year, having been poor the year before. Similarly, λ_{np} represents what is known as the poverty entry rate, which may be understood as the (conditional) probability that a household may be poor in one year, having been non-poor the year before.

Similarly, λ_{pp} represents the duration of poverty, which is the (conditional) probability that a household will remain poor in one year, having also been poor the year before. λ_{nn} represents the duration of non-poverty, which is the (conditional) probability that a household will remain non-poor in one year, having also been non-poor the year before.

It should be noted that $\lambda_{pn} = 1 - \lambda_{pp}$, and $\lambda_{np} = 1 - \lambda_{nn}$. Moreover, the poverty rate, in a stationary population where poverty exit and entry rates remain constant over time, tends to approach the value $H^* = I/[1 + (\lambda_{pn}/\lambda_{np})]$, which is known as the headcount or stationary status index.

If the poverty and non-poverty duration and exit rates that comprise a poverty transition matrix are interpreted as the conditional probabilities that a household (or individual) in a stationary population will experience a transition, having been poor at an earlier point in time, then the poverty status of households (or individuals) describes what is known as a first-order Markov process or chain.

In addition to tabulation-based analyses, econometric techniques are frequently used in the field of poverty dynamics to plot the behaviour of the variables involved.

According to Bane and Ellwood (1983), two main approaches can be identified. One involves using a

⁴ The poverty rate or poverty headcount index can be defined as a q/n ratio, where q represents the number of poor individuals or households, and n represents the total number of individuals or households at a given point in time.

variety of methods to try to directly calculate the duration of poverty spells, as well as the probability of observable transitions. The other seeks to calculate a variable that represents well-being in order to isolate the permanent component of well-being from the transitory fluctuations that surround it.

According to Cantó (1998), the approach which seeks to directly measure spell durations and transition probabilities is associated with a trend which focuses on models that include discrete dependent variables. Bane and Ellwood (1983) employ a three-step approach to develop their basic methodology for estimating the duration of poverty spells. First, they identify spells. Then they calculate exit probabilities by year, and then use exit probabilities to generate distributions of spell lengths for new spells and for completed and uncompleted spells observed at a point in time.

Stevens (1995) takes poverty-spell analysis a step further, examining the potential impact of multiple poverty spells within a given time frame on the chances of exiting and re-entering poverty.

Baulch and McCulloch (1998) and Paz (2002) employ what is known as a proportional hazard model to estimate the effect of various demographic and socio-economic explanatory variables on the probability of a household or individual experiencing

a poverty transition. This proportional hazard model is closely related to the Logit model applied to binary choice cases, which was used to obtain some of the results presented below.

The approach which seeks to measure an indicator of well-being, applied by Lillard and Willis (1978) and Rodgers and Rodgers (1991), involves calculating a well-being indicator in order to isolate the permanent component of an individual's well-being from the transitory fluctuations surrounding it. Chronic poverty is measured by the degree to which this permanent component falls below the poverty line. Situations of poverty attributable to deviations surrounding the permanent component are defined as transitory poverty. According to Bane and Ellwood (1983), the advantage of this approach is that it mirrors the Friedman theoretical decomposition of permanent and transitory income and also deals explicitly with the problem that the poverty line is an arbitrarily defined standard, around which income can fluctuate randomly. The chronically poor may be defined as those whose long-term per capita consumption (or permanent income, according to the life-cycle theory) is below the poverty line; the difference between observed poverty and permanent poverty lies in the transitory component of the latter.

III

Development of a cross-sectional panel

The purpose of this research was to study the dynamics of poverty in Costa Rica between 2000 and 2002. This required a panel of households capable of providing information on poverty status and other socio-economic and demographic variables for each of the three years in question. In Costa Rica, however, no such panel surveys are conducted.

The study of poverty in Costa Rica focuses on the data collected by the Multi-purpose Household Survey (EHPM), which is conducted on a yearly basis, every July, by the National Institute of Statistics and Census (INEC).

The EHPM, which covers the entire country, re-uses a certain subset of its household sample from one year to the next, as will be explained in greater detail below. This provides a very useful launching point from which to identify households that are surveyed on successive occasions for more than one year.

The sample design employed by the EHPM is probabilistic, area-based, stratified and divided into two stages. A two-stage sample design is employed because the sampling process is similarly divided. The first stage involves selecting segments composed of limited, defined geographic areas which, taken together, cover the entire country. The second stage involves the systematic selection of households within each of the segments chosen during the first stage.

The survey has been employing the same first-stage segments since 1999, when the current sample frame began its run.

Most of the households selected during the second stage of sampling are the same each year, but 25% of them undergo a process known as "rotation", whereby households that have been systematically selected are replaced with geographically adjacent ones.

Accordingly, during two successive survey years, 75% of the segments making up the sample are comprised of the same households; if three successive years are examined, this percentage drops to 50%, and so on. Since a different 25% of the segments is rotated each year, the entire sample changes every four years. Consequently, the survey sample used during any given year is not independent from the one used during the years before.

INEC maintains two separate databases for the EHPM. One is devoted to segments, and is used to store sample-frame data – that is, information regarding the segments selected during the first stage of the sampling process. Each household is assigned a number that is then used to locate it on a map of the segment to which it belongs. The name of each household head is also recorded, as is the number of the form or questionnaire which will be used to conduct the interview during the fieldwork stage.

The second database is devoted to households and is used to store the information obtained from the forms or questionnaires employed during interviews, including the full range of demographic and socio-economic variables compiled by the survey. It also includes other variables derived from these demographic and socio-economic variables. This database does not include household numbers or individual names, but it does include segment and questionnaire or form numbers.⁵

The process of developing the required household panel from the information in the segment database began with the identification of households that had received consecutive survey visits during the years in question and that were headed by individuals whose names, as recorded in the survey, were either the same each year or suggested a family relationship.

During the second stage of the process, segment and questionnaire numbers for each year and household were used to retrieve the information recorded in each questionnaire from the household database, thereby creating a file of households that were eligible for the panel. The questionnaire is the key that links the segment and household databases.

During the third stage, households found to be headed by the same person, whose identity had been confirmed by the gender variable, who had been listed as the head of household for at least one of the three

years in question and whose stated age had progressed in a manner which allowed a maximum error margin of one year were selected for the panel.

Finally, cases in which income was zero or unknown for one or more of the three years comprising the panel were excluded, since the definition of poverty to be used by the study was based on poverty lines and would therefore require information on household income.

This process resulted in the development of a panel data set comprised of 1,420 households with known income levels throughout the three years in question. The panel sample represents 16.5%, 16.6% and 15.2% of the overall size of the survey sample in 2000, 2001 and 2002, respectively.

This approach to the construction of a household panel entails a loss of information when households move to locations that are not visited the following year. No attempt was made to locate these households, however, given the limited resources of the study.

In order to obtain results of the same order of magnitude for poverty dynamics as those obtained for cross-sections (which are published using the EHPM), another expansion factor, aside from the one already included in the survey databases, was considered necessary in order to obtain population values. This additional factor was defined as the quotient resulting from the division of the size of the survey sample during the first year of the panel by the size of the panel sample, by stratum.⁶ By expanding the panel observations, a total of 803,989 households with known income levels over the three years comprising the study were obtained. This figure is 0.2% lower than the estimate for 2000, which was based on the overall cross-sectional sample (805,533 households).

In order to determine how representative the panel data could be, the relative distributions of certain variables included in both the panel and the EHPM sample were compared; they were found to be substantially similar.

With regard to the sex variable (for the head of household), the differences between the distribution values produced by the sample and those produced by the panel were lower than half a percentage point in every case.

The relative distribution of the age variable (of the head of household) in the panel sample is also very similar to that of the survey sample, as shown in table 4 and figure 1.

⁵ Individual names are manually recorded on the survey form, but are not included in the database. Household numbers were added to the form and database in 2004.

⁶ As mentioned above, the EHPM employs a stratified sample design, which consists of 12 strata –one urban and one rural for each of the six planning regions that comprise the country.

TABLE 4

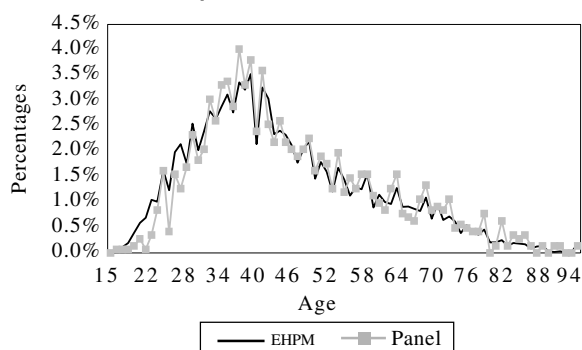
**Costa Rica: Age variable statistics for heads of household
in the Multi-purpose Household Survey and the panel, 2000-2002**

	2000		2001		2002	
	EHPM	Panel	EHPM	Panel	EHPM	Panel
Sample size	8 593	1 420	8 555	1 420	9 344	1 420
Mean	45.66	47.22	45.79	48.28	45.56	49.14
Median	43.00	44.00	43.00	45.00	43.00	46.00
Maximum value	99.00	99.00	99.00	99.00	99.00	99.00
Minimum value	15.00	16.00	16.00	19.00	15.00	17.00
Standard deviation	15.17	15.14	15.35	15.06	15.34	15.08
Asymmetry	0.69	0.71	0.71	0.69	0.70	0.69
Kurtosis	2.96	2.91	3.01	2.85	3.01	2.86
Jarque-Bera	682.50	121.28	716.39	113.50	772.08	113.80
Probability	0.00	0.00	0.00	0.00	0.00	0.00

Source: Authors calculations using 2000-2002 Multi-purpose Household Survey (EHPM) and panel data.

FIGURE 1

**Costa Rica: Relative distribution of the age
variable (head of household) in the
Multi-Purpose Household Survey (EHPM)
and the panel, 2000**



Source: Authors calculations using data from the 2000 Multi-purpose Household Survey (EHPM) and panel data.

In the case of the age variable, the mean and the median increase by one year with each successive year on the panel. This is consistent with the existence of the panel itself. The standard deviation is also virtually identical in both the EHPM and the panel.

As shown in figure 1, the relative distribution of the age variable is almost identical in the EHPM and the panel.

Other variables, such as household size and the expansion factor, display behaviour similar to that of the age variable.

In addition to the comparisons made between sample variables, certain population values obtained by expanding EHPM and panel data were also compared.

When the overall number of households was compared by stratum, for example, deviations displayed

by the expanded panel data with respect to the expanded EHPM were found to be under 1% (in terms of absolute value) for all strata –and for the country as a whole. The only exception was the stratum comprising the urban area of the Huetar Norte region in 2000 and 2001, which displayed deviations of -3.0% and -1.82%, respectively. This suggests that the relative distribution by region and area of households with known income levels is almost identical in the two cases.

Poverty status is another variable that could be compared. The poverty rate figures for the country as a whole that were obtained from the panel data are quite similar to those obtained from the EHPM (differences amount to 1.9 percentage points, at most, with respect to a 20.6% poverty rate in 2002).

An additional panel data experiment involved calculating the Gini coefficient using those data, and then comparing it to that obtained from the EHPM. The results are shown in table 5.

Table 5

**Costa Rica: Gini Coefficient of household
income distribution obtained from the
Multi-Purpose Household Survey and
the panel, 2000, 2001 and 2002^a**

	EHPM (1)	Panel (2)	Difference (3)=(1)-(2)
2000	0.4004	0.3919	0.0085
2001	0.4230	0.4084	0.0146
2002	0.4215	0.4082	0.0133

Source: Authors' calculations using EHPM data.

^a The Gini coefficient was calculated by grouping households according to per capita income deciles, adjusted for underreporting.

As shown above, the Gini coefficient is consistently –though not substantially– lower when calculated using panel data than it is when using EHPM information. The panel data also reflect the same trend as the sample data, namely, a substantial increase between 2000 and 2001, and a very slight drop between 2001 and 2002.

Finally, in order to briefly examine the consistency of the panel as a longitudinal data set, a random sample of 14 households (1% of the overall sample) was selected, and the behaviour of certain demographic

and socio-economic variables among their members was visually verified. It was determined that, even if stricter criteria were used to establish whether or not a household was the same one surveyed earlier, including tracking changes in the demographic or educational characteristics of other household members (as well as in the sex and age of the head of household), in 100% of these randomly selected cases there was sufficient evidence to conclude that the same households had indeed been examined throughout the three years of the study.

IV

Main results of the study of poverty dynamics

Table 6 summarizes the results of the study of the dynamics of poverty between 2000 and 2002, according to the panel.

These findings show that, between 2000 and 2002, 62.97% of households were non-poor throughout the three-year period in question; consequently, during the same period, 37.03% of households experienced poverty for at least one year. This figure considerably exceeds (indeed, almost doubles) the approximate poverty rate for each specific year comprising the period, which is 20%.

Households that qualify as chronically poor (those which were poor throughout the period) account for 8.84% of all households studied. These households

are more heavily concentrated in rural areas than are poor households as a whole in each year and are headed by individuals with very little schooling. In 91% of cases, in every year studied, the head of household had attended only primary school. The proportion of chronically poor households headed by employed persons is quite low (between 53% and 59% during the period in question). Most heads of household in this group are employed in agriculture, as own-account workers or employees of private businesses. Many of those who are economically inactive are older persons with no income.

The rest of the households that experienced poverty during the period in question (28.19% of the total) were poor for one or two of the three years studied.

Figure 2 illustrates how, with the 2000 poverty rate as a point of reference, transitions between poverty and non-poverty determined the composition of poor and non-poor clusters over the next two years. The poverty rate, calculated using expanded panel data, did not vary significantly between 2000 and 2001 or between 2001 and 2002, hovering between 21% and 22%. Despite the relative stability of the poverty rate, significant movement was observed between poverty and non-poverty status over the course of the two transitions studied (2000-2001 and 2001-2002).

As shown in table 7, between 2000 and 2001 the poverty status of 9.53% of all households studied shifted from non-poor to poor, and a very similar percentage (9.22%) shifted from poor to non-poor. During the following transition, between 2001 and 2002, 9.48% (= 6.23% + 3.25%) of all households shifted from non-

TABLE 6

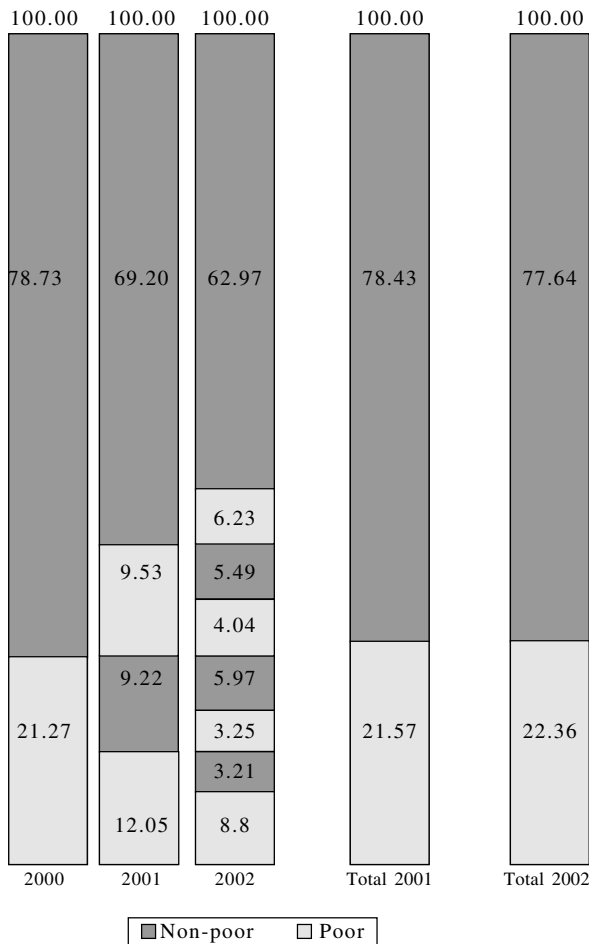
Costa Rica: Frequency of household poverty transitions between 2000 and 2002

No.	Sequence type		Expanded panel results	
	Literal description	Algebraic description	Absolute	Relative
1	(N, N, N)	(0, 0, 0)	506 300	62.97
2	(N, N, P)	(0, 0, 1)	50 073	6.23
3	(N, P, N)	(0, 1, 0)	44 133	5.49
4	(N, P, P)	(0, 1, 1)	32 449	4.04
5	(P, N, N)	(1, 0, 0)	48 027	5.97
6	(P, N, P)	(1, 0, 1)	26 140	3.25
7	(P, P, N)	(1, 1, 0)	25 784	3.21
8	(P, P, P)	(1, 1, 1)	71 083	8.84
<i>Total</i>			803 989	100.00

Source: Authors' calculations using panel data.

Figure 2

Costa Rica: Household poverty trends. 2000-2002
(Percentages)



Source: Authors' calculations using panel data.

poor to poor, while 8.70% (= 5.49% + 3.21%) shifted from poor to non-poor. The similarity of these percentages is consistent with the fact that the poverty rate remained almost unchanged during the period in question.

TABLE 7

Costa Rica: Household poverty dynamics indicators, 2000-2002^a

Transition	λ_{pp}	λ_{pn}	λ_{np}	λ_{nn}	H^*	C
2000-2001	0.5664	0.4336	0.1210	0.8790	0.2181	0.1875
2001-2002	0.5969	0.4031	0.1209	0.8791	0.2307	0.1818

Source: Authors' calculation using data from table 6.

^a λ_{pp} = poverty duration rate; λ_{pn} = poverty exit rate; λ_{np} = poverty entry rate; λ_{nn} = non-poverty duration rate; H^* = stationary status index; C = proportion of households which migrated from one poverty status to another.

Transition matrices were used to develop table 7, which shows poverty exit and entry rates, poverty and non-poverty duration rates, the stationary status index and other poverty dynamics indicators.

Of all households that were poor in 2000, 56.64% remained poor in 2001, and 43.36% exited poverty. Of all households that were non-poor in 2000, 12.10% entered poverty in 2001, while 87.90% remained non-poor that year. Given these poverty exit and entry rates, the stationary status index (H^*), which represents the long-term equilibrium value of the poverty headcount rate, given a constant population and steady poverty entry and exit rates, would be equivalent to 21.81%. Eighteen-point-seventy-five percent of all households experienced some form of transition between 2000 and 2001.

The 2001-2002 period witnessed a drop in the poverty exit rate, from 43.36% in 2001 to 40.31% in 2002, while the poverty entry and non-poverty duration rates remained virtually unchanged. This led to a considerable increase in the stationary status index, which rose by 1.26 percentage points – a figure consistent with the increase in the household poverty rate during this period (0.3 percentage points), according to official INEC figures.

Of the households that were observed to be poor in 2000 and exited poverty in 2001 (which total 74,167 units), 64.76% were able to avoid poverty in 2002, while the remaining 35.24% slipped back in. Of the 76,582 households that were observed to be non-poor in 2000 and slipped into poverty in 2001, 57.63% managed to leave it in 2002, while 42.37% remained poor.

Data from Peru and Argentina offer an interesting comparison in this regard. In the case of Peru, Herrera (2001) reports a poverty exit rate of 25.5% and an entry rate of 23.8% among persons who experienced transitions between 1997 and 1999. In this case, the poverty exit rate was considerably lower than that observed for Costa Rican households between 2000 and 2002, while the entry rate was almost twice that of Costa Rica. In Argentina, according to Paz (2002),

poverty entry rates between 1998 and 2000 were slightly lower than those observed in Costa Rica between 2000 and 2002, hovering between 9.9% and 11.5% in three successive waves. Poverty exit rates, however, were substantially lower, hovering between 23.3% and 30.0% during the same period (compared to an exit rate of approximately 40% in Costa Rica between 2000 and 2002).

Households suffering from extreme poverty displayed considerable mobility. During the 2000-2001 transition, one third of such households (32.80%) exited poverty, while 30.70% joined a category made up of poor households whose basic food needs are met, and 36.50% remained in extreme poverty. During the following transition (2001-2002), matters deteriorated somewhat for the extremely poor, as the poverty exit rate lost 4.87 percentage points to the extreme poverty exit rate.

The experience of the non-poor was similar during each transition. Approximately 88% avoided poverty; of those who entered poverty, about one fifth slipped into extreme poverty.⁷

The study analysed transition matrices for poor and non-poor households using a number of relevant variables. One general observation resulting from this analysis is that the socio-economic and demographic variables associated with increased poverty rates from a static perspective also shed considerable light on poverty duration and entry from a dynamic perspective.

The two sets of tables shown below illustrate the transitions observed, breaking them down according to area and sex. The first two tables, 8 and 9, show the transitions experienced by poor households according to area of residence.

The poverty exit rate was observed to be significantly higher in urban areas than in rural areas, during both the 2000-2001 and the 2001-2002 transitions; even during the former, the exit rate in urban areas exceeded the poverty duration rate, unlike the overall rates. This suggests that urban areas may offer a more diverse range of employment opportunities than rural areas.

⁷ Herrera (2001) reports similar results for Peru in 1997-1999.

TABLE 8

Costa Rica: Transitions experienced in 2000-2001 by households observed to be poor in 2000, by area of residence^a

Area	Total		Remained poor			Exited poverty		
	Absolute	%	Absolute	%	λ_{pp}	Absolute	%	λ_{pn}
Total	171 034	100.00	96 867	100.00	56.64	74 167	100.00	43.36
Urban	85 870	50.21	41 702	43.05	48.56	44 168	59.55	51.44
Rural	85 164	49.79	55 165	56.95	64.78	29 999	40.45	35.22

Source: Authors calculations using panel data.

^a λ_{pp} = poverty duration rate; λ_{pn} = poverty exit rate.

TABLE 9

Costa Rica: transitions experienced in 2001-2002 by households observed to be poor in 2001, by area of residence^a

Area	Total		Remained poor			Exited poverty		
	Absolute	%	Absolute	%	λ_{pp}	Absolute	%	λ_{pn}
Total	173 449	100.00	103 532	100.00	59.69	69 917	100.00	40.31
Urban	79 966	46.10	42 884	41.42	53.63	37 082	53.04	46.37
Rural	93 483	53.90	60 648	58.58	64.88	32 835	46.96	35.12

Source: Authors calculations using panel data.

^a λ_{pp} = poverty duration rate; λ_{pn} = poverty exit rate.

It is also interesting to note that, when the overall poverty exit rate drops (as it did during the 2001-2002 transition), the effect of the drop is concentrated in urban areas. In rural areas, the poverty exit rate appears to be somewhat rigid, as it remained virtually constant, at approximately 35%, during both periods.

Tables 10 and 11 show the transitions experienced by non-poor households, according to the sex of the head of household.

Non-poor households headed by females appear to be at greater risk of slipping back into poverty than male-headed households. This was especially clear during the 2000-2001 transition.

Other important findings derived from transition matrices suggest that a household is more likely to exit poverty if its head is better educated, if its membership is decreasing or if the number of income-generating members is increasing and if the household head is employed in a field other than agriculture and livestock.

A household's risk of slipping back into poverty is even greater if it is located in a rural area or in a region other than the central region (which is home to the country's main cities), if it is headed by a woman

and if the head of household is employed in agriculture or has little schooling.

In addition to the transition matrix analysis performed, two econometric Logit models were developed—one to explain the probability of households exiting poverty, the other to estimate the probability of re-entry. The results are shown in table 12.

The null hypothesis would be that the value of the coefficient of each one of the variables in the estimate is zero; this was rejected for every variable used in the estimates, with a level of significance exceeding 99%.

Explanatory variables played a significant role in both models, indicating that households in the central region of the country are more likely to exit poverty than households in any other region. Households headed by males have a better chance of escaping poverty than those headed by females. The higher the ratio between per capita household income and the poverty line, the greater the chances are of exiting poverty. Moreover, if a head of household is looking for work, is on disability or is employed, the household's chances of exiting poverty are greater than they would be if the head were economically inactive.

TABLE 10

Costa Rica: Transitions experienced in 2000-2001 by households observed to be non-poor in 2000, by sex of household head in 2000^a

Sex of household head	Total		Remained non-poor			Entered poverty		
	Absolute	%	Absolute	%	λ_{nn}	Absolute	%	λ_{np}
Total	632 955	100.00	556 373	100.00	87.90	76 582	100.00	12.10
Male	491 803	77.70	439 582	79.01	89.38	52 221	68.19	10.62
Female	141 152	22.30	116 791	20.99	82.74	24 361	31.81	17.26

Source: Authors calculations using panel data.

^a λ_{nn} = non-poverty duration rate; λ_{np} = poverty entry rate.

TABLE 11

Costa Rica: Transitions experienced in 2001-2002 by households observed to be non-poor in 2001, by sex of household head in 2001^a

Sex of household head	Total		Remained non-poor			Entered poverty		
	Absolute	%	Absolute	%	λ_{nn}	Absolute	%	λ_{np}
Total	630 540	100.00	554 327	100.00	87.91	76 213	100.00	12.09
Male	486 308	77.13	429 936	77.56	88.41	56 372	73.97	11.59
Female	144 232	22.87	124 391	22.44	86.24	19 841	26.03	13.76

Source: Authors calculations using panel data.

^a λ_{nn} = non-poverty duration rate; λ_{np} = poverty entry rate.

TABLE 12

Costa Rica: Results of probability model estimates that explain poverty exit and entry, 2000-2002

Variables	Poverty exit		Poverty entry	
	Coefficient (standard error)	Z value ($P > z $)	Coefficient (standard error)	Z value ($P > z $)
Central region (<i>regionce</i>)	0.1381 (0.0097)	14.27 0.000	-0.2056 (0.0069)	-29.85 0.000
Urban areas (<i>zonaurb</i>)	0.4475 (0.0108)	41.51 0.000	0.1135 (0.0074)	15.39 0.000
Per capita income / poverty line ratio (<i>distline</i>)	1.0815 (0.0191)	56.50 0.000	-0.2926 (0.0027)	-106.95 0.000
Type of agricultural activity (<i>agric</i>)	-0.3696 (0.0128)	-28.86 0.000	0.8464 (0.0092)	91.71 0.000
Active	0.5038 (0.0133)	37.98 0.000	-0.2079 (0.0099)	-20.99 0.000
Male	0.2054 (0.0111)	18.45 0.000	-0.5253 (0.0078)	-67.25 0.000
Age	-0.1434 (0.0004)	-37.85 0.00062	-0.0043 (0.0003)	-15.44 0.000
Education (<i>educ</i>)	0.3645 (0.0058)	62.45 0.000	-0.3319 (0.0031)	-105.96 0.000
Dependents per wage earner (<i>deporper</i>)	-0.2540 (0.0030)	-84.27 0.000	0.1375 (0.0029)	48.10 0.000
Change in household size (<i>dtamahog</i>)	-0.3116 (0.0051)	-61.32 0.000
Constant	0.0260 (0.0293)	0.89 0.376	0.4027 (0.0205)	19.64 0.000
<i>Model statistics</i>				
Observations		247 617		707 122
Model Chi ²		34 650.69		92 239.68
Chi ² probability		0.0000		0.0000
Pseudo R ²		0.1250		0.1029
Overall percentage of correct predictions		65.0		78.5

Source: Authors calculations using regression results.

Another statistically significant variable that explains the probability of exiting poverty is the ratio between dependants and wage earners (*deporper*): the larger the number of individuals that depend on the income of a wage earner, the greater the volume of needs that must be satisfied with that wage earner's income.

The "change in household size" (*dtamahog*) variable was also statistically significant. The more the number of household members changes, the lower the household's chances are of exiting poverty. All

variables proved to be statistically significant during the development of the poverty entry model. The sign of the coefficients was also as expected for all variables, except for the urban areas (*zonaurb*) variable. Households headed by females employed in agriculture are more likely to enter poverty. The greater the age of the head of household, the lower the probability of entering poverty.

Logit model results can be used to calculate the marginal effects of the model's explanatory variables

on the probabilities of observing the phenomenon studied. In other words, marginal effects show the proportion by which the probability of exiting or entering poverty varies as a result of a single change in the explanatory variables. The results obtained for these variables are shown in table 13.

If the vector of the estimated coefficients is multiplied by X from the preceding table, and the result is used as an argument in the function derived from the logistic regression, the probability of entering poverty in Costa Rica for non-poor households is obtained, provided the variables of the preceding model are assumed to be explanatory and their mean values are

used. According to this model, the probability of entering poverty during the period studied is 15.4%, which does not differ significantly from the 12.0% obtained from the above transition matrices. This result suggests that the poverty entry probability model explained above works well and is capable of providing an overall estimate of the direction of poverty entry probability variations resulting from changes in independent variables.

After calculating marginal effect values, the poverty exit probability model places the poverty exit rate at 59.5%, compared to the 40%-43% rate obtained by the transition matrices, as explained earlier.

TABLE 13

Costa Rica: poverty entry probability model - marginal effects

Variables ^a	dy/dx	Standard error	z	$P > z $	X
<i>regionce</i>	-0.0273992	0.00094	-29.07	0.000	0.664663
<i>zонаurb</i>	0.0146498	0.00095	15.50	0.000	0.603390
<i>distline</i>	-0.0380754	0.0003	-126.56	0.000	3.46301
<i>agric</i>	0.1346584	0.00176	76.72	0.000	0.136805
<i>active</i>	-0.0281875	0.0014	-20.12	0.000	0.783390
<i>male</i>	-0.0751096	0.00123	-61.12	0.000	0.761579
<i>age</i>	-0.0005629	0.00004	-15.43	0.000	48.2432
<i>educ</i>	-0.0431979	0.0004	-106.68	0.000	1.69709
<i>deporper</i>	0.0179003	0.00038	47.26	0.000	1.40086

Source: Authors calculations using regression results.

^a For full variable names, see table 12.

V

Conclusions

This study shows that panel data sets can be constructed using cross-sections from a survey for which a portion of the sample is changed over time.

The procedure used to construct the panel constitutes an alternative for the study of poverty dynamics in developing countries, where surveys are based on successive samples that are not fully independent.

Within the limitations imposed by the characteristics of the data set used, this study shows that a significant number of households in Costa Rica enter and exit poverty over time, despite the relative stability of the country's poverty rate and economic environment.

If a broader definition of household poverty were adopted (for example, if a household which has experienced poverty at least once during a consecutive three-year period were defined as poor), then the number of poor households would rise to 37%, which is almost twice the general trend rate of 20% observed over the last few years. This means that, during the three-year period studied, 37% of households would have experienced poverty, although only slightly more than half that percentage would have been poor during any given year.

Moreover, 60% of poor households tend to remain poor, while the remaining 40% manage to escape poverty. Eighty-eight percent of non-poor households

tend to remain non-poor, while 12% slip into poverty each year. Of the latter, almost one fifth lapse into extreme poverty.

One general conclusion which may be drawn from the study is that certain variables (such as education, area of residence and number of wage earners) associated with poverty from a static perspective can also be linked to poverty from a longitudinal perspective.

The study also found that a significant proportion of households experience poverty transitions, despite the stability of macroeconomic indicators such as

inflation, unemployment, the production structure of the country and the poverty rate itself.

Given the fact that the poor constitute a group with a shifting membership, government leaders must fine-tune their approach in order to devise and execute policies that take into account the dynamic nature of the phenomenon. As a matter of general principle, government policies aimed at combatting poverty should promote not only those factors which help households exit poverty, but also those which prevent poverty entry.

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