

Rodgers, Joan R; Rodgers, John L

Working Paper

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Working Paper, No. 55

Provided in Cooperation with:

Levy Economics Institute of Bard College

Suggested Citation: Rodgers, Joan R; Rodgers, John L (1991) : The Measurement of Chronic and Transitory Poverty: with Application to the United States, Working Paper, No. 55, Levy Economics Institute of Bard College, Annandale-on-Hudson, NY

This Version is available at:

<https://hdl.handle.net/10419/186745>

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The Measurement of Chronic and Transitory Poverty;
with Application to the United States

by

Joan R. Rodgers*
John L. Rodgers**

Working Paper No. 55

June 1991

*The Jerome Levy Economics Institute and the University of North Carolina at Greensboro, NC

**University of North Carolina at Greensboro, NC

This research was supported by a Fellowship from The Jerome Levy Economics Institute of Bard College.

ABSTRACT

This paper proposes a method of measuring chronic and transitory poverty based on any additively-decomposable index of aggregate poverty. Chronic poverty and transitory poverty in the United States are measured using data from the Panel Study of Income Dynamics (1987 interviewing year). In an attempt to identify the most impoverished subpopulations, poverty indices are decomposed according to race, type of household and educational qualifications of the head of the household.

1. INTRODUCTION

This paper is concerned with the measurement of chronic and transitory components of aggregate, income poverty.¹ Such measurement is likely to be helpful in developing more realistic models of poverty causation and persistence. In particular, concepts of an "underclass" and a "culture of poverty" rest upon the assumption that certain groups experience poverty which is both severe and long term in nature; so much so that poverty is likely to be passed from one generation to another.² If poverty is essentially a short-term phenomenon then theories about the existence of an "underclass" or a "culture of poverty" lack credibility. Identification of chronic and transitory poverty is also important from a policy perspective. Since remedial policies for chronic and transitory poverty are likely to be different, measurement of chronic and transitory poverty should be helpful in the design, targeting and evaluation of poverty reduction programs.

Central to the identification of chronic and transitory poverty is the choice of time period over which to measure income. Studies of aggregate poverty typically have based their computations on a one-year income period. The collection of data on an annual basis makes a one-year income period a convenient choice but not necessarily the best choice; the latter depends on the objective to be accomplished. If the objective is to identify people in need of emergency aid then a one-year income period may be too long. If the objective is to identify people who lack the means to achieve a satisfactory standard of living then a one-year income period may be too short. The orientation of this paper is in the latter direction and we agree with Rainwater (1981, p.5) that permanent income (or the lack of it) is "probably the principal influence on people's

standard of living and style of life". Therefore, an income period longer than one year should lead to a better understanding of the causes and consequences of long-term poverty than can be gained using income periods of one year or less. The availability of longitudinal data sets, such as the Panel Study of Income Dynamics (PSID), has made it possible to measure income over periods longer than one year.

With the exception of Rainwater (1981), previous investigators of persistent and transitory poverty have eschewed the concept of permanent income in their analyses. Instead, they have assessed the adequacy of annual income in meeting annual needs in each of a sequence of years, an approach which reflects an emphasis on determining eligibility for welfare programs rather than understanding the nature of poverty.³ In using a one-year income period, these studies, like cross section studies of aggregate poverty, have adopted the (usually implicit) assumption that income is perfectly transferable within the year in which it is earned, but is not at all transferable between years. The savings behavior of households over extended periods suggests that intertemporal transfers of income are important. Household borrowing against future income also occurs, although to a lesser extent than saving. Furthermore, the economic theory of household behavior supports the view that rational agents will engage in intertemporal income transfers if their income-to-needs ratios vary through time and if interest rates are "moderate" relative to rates of time preference (King, 1985). Accordingly, we believe that aggregate poverty measurement should reflect this behavior.

The objectives of this paper are threefold: to propose a method for measuring transitory and chronic poverty based on some existing indices of

aggregate poverty; to report the results obtained when our method is applied to U.S. income data; and finally to propose some tentative generalizations based on our findings regarding transitory and chronic poverty measurement.

The paper proceeds as follows. Section 2 explains the logic of our method of measuring chronic and transitory poverty using a simple example. Section 3 reviews alternative approaches and discusses their advantages and disadvantages compared with ours. We discuss our methodology in more detail, including some complexities and their resolution, in Section 4. In Section 5 we describe the data used in the application of our procedure to the measurement of poverty in the U.S., and in Section 6 we present and discuss our results. Section 7 comments on the empirical findings and offers some concluding remarks.

2. CHRONIC AND TRANSITORY POVERTY: AN ILLUSTRATIVE EXAMPLE

Using any additively-decomposable poverty index,⁴ P , we define a T -year aggregate poverty index, $AP_P(T)$, as a weighted average of the corresponding T annual poverty index values, P_1, P_2, \dots, P_T . That is,

$$(1) \quad AP_P(T) = \sum_{t=1}^T w_t P_t$$

where $\sum_{t=1, T} w_t = 1$. For the remainder of this paper $AP_P(T)$ will be called the "T-year poverty index". If all members of the population are present in all T years then $w_t = 1/T$ ($t=1, 2, \dots, T$). For the illustrative examples in this section we will assume equal weights. In Section 4 we shall discuss situations where births, deaths, and migration cause some population members to be absent in some years. As a measure of poverty, $AP_P(T)$ adheres to the traditionally-made assumption in the poverty literature that no agent makes inter-year transfers

of income in order to satisfy needs.

The measurement of chronic poverty requires a measure of "long-term" income which can be compared with "long-term" needs. With a T-year income period our measure of an agent's long-term income is an annual income level equal to the maximum sustainable annual consumption expenditure (MSACE) which the agent could achieve with his or her actual income stream over the same T years, given the prevailing interest rates on saving and borrowing. If the interest rates on saving and borrowing are equal then the agent's MSACE is the annuity which has the same value as the agent's actual income stream over the same T years.⁵ When, in addition, the interest rate is constant over time, the value of this income-equivalent annuity is independent of the period chosen at which to compute the value of the actual income stream. For simplicity, we will assume in this section that the annual interest rate is constant and the same for both saving and borrowing. In Section 4 we will discuss the complexities introduced when the interest rate varies through time and when the savings rate differs from the borrowing rate. In summary, using any additively-decomposable poverty index, P, we measure chronic poverty over T years, $CP_P(T)$, as:

$$(2) \quad CP_P(T) = P(A_{T1}, A_{T2}, \dots, A_{Tn})$$

where n is the population size, A_{Ti} is agent i's MSACE over T years, and $P(\cdot)$ is the poverty index, computed on the assumption that each agent earns an annual income equal to his or her MSACE. Therefore, unlike $AP_P(T)$, $CP_P(T)$ assumes agents make inter-year income-equalizing transfers for the purpose of satisfying needs.

Our measure of transitory poverty over T years, $TP_P(T)$, based on any additively-decomposable poverty index, P, is defined as a residual, namely:

$$(3) \quad TP_P(T) = AP_P(T) - CP_P(T).$$

If P satisfies the transfer axiom,⁶ in addition to being additively decomposable, then the proportion of poverty which is chronic, $CP_p(T)/AP_p(T)$, lies between zero and one, inclusive. The latter ratio tends to be insensitive to the value of the poverty line, a highly desirable characteristic in view of the arbitrary manner in which the poverty line is determined.⁷

The head-count ratio, H, is an additively-decomposable poverty index. When H is used in Equation (1), and $w_t = 1/T$ ($t=1,2,\dots,T$), the T-year poverty index is:

$$(4) \quad AP_H(T) = (1/T) \sum_{t=1}^T H_t = (1/T) \sum_{t=1}^T (m_t/n)$$

where m_t is the number of population members whose incomes in year t are less than their needs. The chronic poverty index based on H is:

$$(5) \quad CP_H(T) = m(A_{T1}, A_{T2}, \dots, A_{Tm})/n$$

where $m(\cdot)$ is the number of agents in the population whose MSACEs fall below the annual poverty level. As will be shown later in this section, the head-count ratio may exhibit perverse behavior when used to measure chronic and transitory poverty. However, because H is easy to understand we shall use it in this section to illustrate some basic concepts.

Consider a population of three agents, A, B, and C, with two-year incomes of {10, 10}, {10, 100} and {100,100}, respectively. Let the poverty level be 50 per annum. The head-count ratios in the two years are $H_1 = 0.67$ and $H_2 = 0.33$, respectively. Therefore, $AP_H(2) = 0.5$. Given an annual interest rate of ten percent, the MSACEs for agents A, B and C are 10, 52.857 and 100, respectively. Therefore, $CP_H(2) = 0.33$ and $TP_H(2) = 0.17$. This first example is summarized as

Case 1 in Table 1. Contrast the above situation with a population of three agents, X, Y and Z, having two-year incomes of (10, 100), (10, 100) and (100, 10), respectively. The latter example also gives head-count ratios of $H_1 = 0.67$ and $H_2 = 0.33$, and so $AP_H(2) = 0.5$. At a ten percent annual interest rate the MSACEs for agents X, Y and Z are 52.857, 52.857 and 57.143, respectively. Therefore, $CP_H(2) = 0$ and $TP_H(2) = 0.5$. This second example is summarized as Case 2 in Table 1.

The above two examples illustrate several characteristics of multi-period poverty measurement. Cases 1 and 2 portray quite different sets of income profiles yet in both cases 0.67 of the population are poor in year 1 and 0.33 in year 2. Therefore, 2-year poverty is also the same (namely, 0.5) in both examples. The two cases demonstrate the inability of cross-section "snap shots" of poverty, and of $AP_P(T)$, which is based upon an annual income period, to capture the nature of poverty over time. The chronic poverty index, $CP_P(T)$, can distinguish between the two cases. In Case 1, one of the three agents, agent A, is poor on the basis of the MSACE and so chronic poverty equals 0.33. The residual, 0.17 (= 0.5-0.33), is transitory in the sense that this amount of measured poverty disappears when inter-year income transfers occur. In Case 2, each agent is poor for only one year if inter-year income transfers are disallowed. When inter-year income transfers occur, no agent is poor and so chronic poverty is zero. This means that all observed poverty in Case 2 is transitory.

The examples presented in Table 1 can be used to illustrate an unsatisfactory feature of the head-count ratio as an index of poverty. If the poverty level is 60, rather than 50, then, in Case 1, $CP_H(2) = 0.67$ and so $TP_H(2)$

= -0.17; in Case 2, $CP_H(2) = 1.00$ and so $TP_H(2) = -0.5$. These peculiar results occur because the head-count ratio violates the transfer axiom. It is well known that the head-count ratio, as an index of poverty, can behave perversely when interpersonal income transfers occur. It is hardly surprising that the index can also exhibit perverse behavior when intertemporal income transfers are encountered, as in our concept of chronic poverty. Hence, for the purpose of measuring chronic and transitory poverty, we advocate the use of indices which satisfy the transfer property.

3. A CRITICAL REVIEW OF ALTERNATIVE MEASURES OF CHRONIC AND TRANSITORY POVERTY

Previous studies of chronic and transitory poverty have adopted one of two approaches, both of which treat poverty as a discrete state and therefore are, in essence, based upon the head-count ratio. The first approach is to tabulate the proportion of people who were poor for a certain number of periods in a given sequence of time periods (Levy, 1977; Coe, 1978; Rainwater, 1981; Hill, 1981; Duncan, Coe and Hill, 1984). The prevalence of chronic versus transitory poverty is then assessed by comparing the proportion of people who were poor in most or all periods (the chronically poor) with the proportion of people who were poor in just a few periods (the transitorily poor). This method has been criticized on the grounds that it is subject to censoring problems; some of the people who were poor for a few periods at either the beginning, or end, of the observed sequence of time periods may have been in the midst of a poverty spell that either began before, or ended after, the sequence of time periods actually observed. Hence, it is claimed that transitory poverty is overstated (Bane and Ellwood, 1986; p.4).

The second approach is to avoid censoring problems by modelling the duration of completed poverty spells (Bane and Ellwood, 1986; Ruggles and Williams, 1989). The percentage of people experiencing long spells are the chronically poor; the percentage experiencing short spells are the transitorily poor. Bane and Ellwood's (1986) study has contributed significantly to our knowledge of the dynamics of poverty. For example, they were able to reconcile the conflicting views of the 1960s (that poverty is mostly long term) and 1970s (that poverty is mostly short term) by demonstrating that a large percentage of those who are poor at a particular point in time are in long-term poverty but only a small percentage of the ever-poor population experience a long poverty spell. Unlike tabulation studies, duration studies are also useful in identifying events, such as changes in family structure, that may cause the beginning or the end of a poverty spell. However, duration studies have no special capability to identify conditions, such as lack of education or opportunity, which may contribute to persistent poverty.

Duration studies view chronic poverty as a state in which income is less than needs during a long and continuous period of time. The claim that tabulation studies are subject to problems of censoring reflects the view that persistent poverty is poverty over many consecutive time periods. But chronic poverty can be viewed alternatively as poverty which lasts for a large proportion of a given time period. If the latter definition is adopted tabulation studies are not subject to censoring and are more appropriate than duration studies, which would view someone with multiple short spells as transitorily rather than chronically poor. Both approaches are potentially misleading if the time period observed does not provide a representative picture of each person's lifetime income profile.

Clearly, the longer the time period observed the more accurate is the information provided by both types of studies, the ideal being observation over an entire lifetime.

All previous studies of chronic and transitory poverty, except Rainwater's (1981), have employed a sequence of income periods of one-year (or less⁸) and consequently have assumed that income earned in one year cannot be used for consumption in any other year. They would have us believe, for example, that, given a poverty line of 25, Person A with a six-year, annual income stream of:

$$\{y_1 = 100, y_2 = 100, y_3 = 100, y_4 = 24, y_5 = 24, y_6 = 100\}$$

is indistinguishable from Person B with a six-year, annual income stream of:

$$\{y_1 = 26, y_2 = 26, y_3 = 26, y_4 = 10, y_5 = 10, y_6 = 26\}.$$

The tabulation approach would record both people as being poor for two out of six years.⁹ A duration study would record both people as experiencing a poverty spell of two years in length. Yet, in years four and five Person A is unlikely to be in a state in which resources are insufficient to meet basic needs (that is, "poor") because of his or her ability to save during the first three years. Person B, on the other hand, probably is in such a state, not only in years four and five but in other years as well.

Both the tabulation approach and the poverty spell approach treat poverty as a discrete state. One is either poor or not poor; the severity of poverty is completely ignored. Even if we accept the argument that inter-year income transfers do not occur, is it likely that Person A is equally as poor as Person B (in the above example) in years four and five? Furthermore, consider Person C with a six-year annual income stream of:

$$\{y_1 = 100, y_2 = 100, y_3 = 24, y_4 = 24, y_5 = 24, y_6 = 100\}.$$

Is it likely, as both tabulation and duration studies would allege, that Person C is more chronically poor than Person B above? We think not!

The approach adopted in this paper, which determines whether people are chronically poor on the basis of their MSACEs, better captures the essence of poverty. Suppose, (conservatively) that borrowing is prohibited but people can save at a zero rate of interest. The people in the above examples would be ranked {B, C, A} in ascending order of their MSACEs but only Person B experiences chronic poverty. Persons A and C experience poverty but it is entirely transitory in nature. Using our methodology, a few bad years does not render an otherwise rich person chronically poor and a few good years does not raise an otherwise impoverished person out of chronic poverty.

The results produced by a methodology which ignores the depth of poverty are very sensitive to the poverty line.¹⁰ This is an undesirable feature of tabulation studies and duration studies because the poverty line is quite arbitrary¹¹ and consequently the methodology is susceptible to political manipulation. On the other hand, poverty indices which are weighted averages of poverty gaps and which place larger weights on larger gaps are less sensitive to the poverty line than indices which simply count the number of poor. Consequently, if P is the former type of index, our measures $AP_P(T)$, $CP_P(T)$ and $TP_P(T)$ are relatively insensitive to the choice of poverty line. The ratio $CP_P(T)/AP_P(T)$ is also insensitive to the poverty line, has intuitive meaning, and conveniently summarizes the degree of chronic poverty among any group of people.

The methodology we propose assumes that inter-year income transfers are feasible, albeit at a rates of interest which may vary through time and may be

different for saving and borrowing.¹² It is sometimes argued that saving and borrowing behavior can be ignored in poverty measurement because the poor have insufficient income to save and they do not borrow because no one will lend to them. We reject this argument. The poor may not use middle-class financial institutions to effect saving and borrowing but that is not evidence that they do not engage in such behavior. Indications to the contrary include the high prevalence of pawn shops in poor neighborhoods, anecdotal evidence of interpersonal borrowing and lending among the poor, and consumer expenditure surveys that find that the poor spend more than they earn over the course of a year.¹³ Furthermore, the nonpoor, who can certainly borrow and save, may record near zero income in some years because of decisions to take extended vacations or engage in some nonearning activity. Head counts based on annual income wrongly identify such people as poor.

An alternative approach to ours is to use an annual income period but to include wealth in the resource base. Unfortunately, the only longitudinal data set which records assets as well as income, the Survey of Income and Program Participation (SIPP), provides only a short series of panel data.¹⁴ The MSACE is a practical way of taking account of the ability to accumulate wealth over the income period. If data on wealth at the beginning of the income period were available it could be directly incorporated into the MSACE calculation.

Finally, we unabashedly assume that the poor are just as capable of rational action as other members of society although they certainly face a more restricted choice set. Main-stream economic theory assumes that agents are rational and therefore will undertake inter-period income transfers if it is to their advantage. Our analysis falls within the realm of main-stream economics.

For those who adhere to a different paradigm, our results will still be of interest for if the poor do not undertake optimal inter-year income transfers their poverty is even more severe than our measures of chronic poverty suggest.

4. METHODOLOGY

4.1 MEASURES OF AGGREGATE POVERTY

The poverty indices employed in our empirical analysis are Blackburn's (1989) index, BLK:

$$(6) \quad \text{BLK} = (1/n) \sum_{i=1}^m \ln(z/y_i) ,$$

and Foster, Greer and Thorbecke's (1984) index, FGT:

$$(7) \quad \text{FGT} = (1/n) \sum_{i=1}^m (1 - y_i/z)^2 .$$

where n is the population size; m is the number of poor; y_i is the real income of the i th agent, $y_i \leq y_{i+1}$ ($i=1,2,\dots,n$), and z is the poverty line. From the set of poverty indices which are sensitive to the number of poor, the mean income of the poor and the distribution of income among the poor, BLK and FGT were chosen because they have additional, desirable properties,¹⁵ properties which are passed on to $AP_{\text{BLK}}(T)$ and $AP_{\text{FGT}}(T)$. We also computed the head-count ratio, $H = m/n$, but do not advocate its use for chronic poverty measurement. Although H has few desirable properties and many undesirable ones, it is so commonly used that its absence from the entire paper might evoke feelings of deprivation among some readers. Some of our results using BLK and FGT are different from those based upon H . When this occurs we refer to the tables containing H but otherwise we do not discuss results based upon H .

4.2 CHRONIC AND TRANSITORY POVERTY: SOME COMPLICATIONS AND THEIR RESOLUTION

There are several practical problems in measuring the chronic and transitory components of poverty. These involve: individuals who change their household type during the income period considered; the definition of the population within which poverty is to be measured; the annual weights used in computing T-year poverty; the calculation of the MSACE when the rate of interest varies through time and is different for saving and borrowing; and the length of income period over which to measure poverty. The first three problems arise because of characteristics of "real-world", longitudinal data sets. We shall discuss these problems in order.

When the income period is two or more years a complication arises because the household within which an individual lives, and presumably shares his or her income, can change its size and composition.¹⁶ We deal with this problem of changing household structure by choosing the individual, not the household or family, as the social unit. We assume that, in a given year, each individual has access to an income equal to the income per adult equivalent of the household in which he or she resides during that year. Throughout the rest of this paper an individual's income should be taken to mean his or her income per adult equivalent. The number of adult equivalents in a household is calculated as the poverty threshold for that household, divided by the poverty threshold for a single-adult household.¹⁷

Another issue which arises in measuring poverty over two or more years is in specifying the population of interest. We define the population of interest to be all individuals who are present at the end of the income period.

Individuals observed during, but not at the end of, the income period are excluded. Appropriate modifications are made in computing the MSACEs for population members who are observed for only part of the income period. We define the population of interest in this way because our empirical analysis employs historical data and so individuals present at the end of the income period (which corresponds to the latest year for which we have data) are likely to provide the most up-to-date representation of the current U.S. population.¹⁸

The choice of weights in computing T-year poverty indices, $AP_p(T)$, can now be considered. Having defined our population of interest, it is likely that some members of the population will not be observed in all years prior to year T; that is, n_t will be less than n_T for some $1 \leq t < T$. In computing $AP_p(T)$, a weight of n_t/N , where $N = \sum_{t=1, T} n_t$, is applied to the poverty index in year t. Using this weighting procedure with Blackburn's index, we obtain:

$$(8) \quad AP_{BLK}(T) = (1/N) \sum_{t=1}^T \sum_{i=1}^{m_t} \ln(z/y_{it}) ,$$

and similarly with Foster, Greer and Thorbecke's index:

$$(9) \quad AP_{FGT}(T) = (1/N) \sum_{t=1}^T \sum_{i=1}^{m_t} (1 - y_{it}/z)^2 ,$$

where y_{it} is the real income of the i th individual in year t .¹⁹

Next, we consider the calculation of the MSACE, which is defined as the maximum level of annual consumption which can be sustained over the income period from the individual's actual income stream when savings (= positive end-of-year balances) earn a savings interest rate and borrowing (= negative end-of-year balances) incur a borrowing interest rate. The savings and borrowing interest rates may be different and both may vary through time.

First we consider the special case when savings and borrowing interest rates are equal but vary over time, after which we introduce the further complication of allowing the savings rate to differ from the borrowing rate. Given a sequence of real, annual incomes, y_1, y_2, \dots, y_T , and a set of real, annual interest rates, r_1, r_2, \dots, r_T , for both saving and borrowing then the MSACE, computed at time q , $1 \leq q \leq T$, is the annuity:

$$(10) \quad A_q = \frac{\sum_{t=1}^{q-1} \left[\prod_{s=t}^{q-1} (1 + r_s) \right] y_t + y_q + \sum_{t=q+1}^T \left[\prod_{s=q+1}^t (1 + r_s)^{-1} \right] y_t}{\sum_{t=1}^{q-1} \left[\prod_{s=t}^{q-1} (1 + r_s) \right] + 1 + \sum_{t=q+1}^T \left[\prod_{s=q+1}^t (1 + r_s)^{-1} \right]}$$

We note that all r_t ($t=1,2,\dots,T$) enter this calculation except r_q and consequently A_q is dependent on the choice of q , unless r_t is constant.²⁰ We choose $q = T$, so that A_q becomes:

$$(11) \quad A_T = \frac{\sum_{t=1}^{T-1} \left[\prod_{s=t}^{T-1} (1 + r_s) \right] y_t + y_T}{\sum_{t=1}^{T-1} \left[\prod_{s=t}^{T-1} (1 + r_s) \right] + 1}$$

There are two reasons supporting the choice of year T as the year on which to base annuity calculations. First, as previously discussed, we decided to define the population as those present at the end of the income period. Second, we believe that empirically, it is most interesting from a policy perspective to examine the behavior of poverty indices as the income period is extended backwards (say, from two through ten years), anchored to the most recent year. Empirically, we have observed the annuity value to be insensitive to the choice of q .

When the savings rate differs from the borrowing rate, and both vary over time, the MSACE is found using the iterative procedure described in Figure 1. The first approximation of the MSACE is the mean annual income. The resulting implied savings/borrowing pattern is used to compute end-of-year balances. If the balance at the end of the final year of the income period is not zero then the savings/borrowing levels are appropriately adjusted. The procedure is repeated until the final end-of-year balance is acceptably close to zero. An illustration of the procedure is given in Table 2. Using a three-year income period and consecutive interest rates of 4 and 5 percent for saving and 19 and 20 percent for borrowing, the MSACEs are calculated for three different income streams. In Example 1, with an income stream of (1000, 100, 100), interest earnings on positive balances are 23.49 and 14.89, and the MSACE is 412.80 per annum. In Example 2, with an income stream of (100, 100, 1000), interest payments on negative balances are 47.13 and 108.65. The MSACE is 348.07. In Example 3, with an income stream of (550, 100, 550), interest earned on the end-of-year 1, positive balance is 6.26, while interest paid on the end-of-year 2, negative balance is 26.10. The MSACE is 393.38. The MSACEs in these three examples are substantially different from each other even though each example involves an average annual income of 400 over the three-year income period.

Finally, we need to consider the length of the income period to be used in measuring poverty. Conceptually, T is the number of years over which agents actually can transfer income by saving and borrowing. Thus defined, we suspect that T varies among agents.²¹ Probably, T is directly related to the wealth and income of the agent, but it could also depend on other factors. For example, if a married-couple separates or divorces and most of the accumulated wealth of the

union stays with one partner, then the other partner may not have access to income earned and saved within the former family unit. In response to the problem concerning the appropriate length of income period, we choose several values of T and observe the extent to which our results depend upon the value of T. While not an ideal solution to the problem, our approach is preferable to using an annual income period as if it were the "natural" period over which to measure income.

4.3 CHRONIC AND TRANSITORY POVERTY: DECOMPOSITIONS

Our measures of multi-period aggregate poverty, based on any additively-decomposable poverty index, P, can themselves be decomposed according to the characteristics of different subpopulations. T-year poverty can be written in the form:

$$(12) \quad AP_P(T) = \sum_{j=1}^L v_j AP_P(T)_j ,$$

chronic poverty can be expressed as:

$$(13) \quad CP_P(T) = \sum_{j=1}^L v_j CP_P(T)_j ,$$

and transitory poverty as:

$$(14) \quad TP_P(T) = \sum_{j=1}^L v_j TP_P(T)_j ,$$

where L is the number of subpopulations, v_j is the proportion of the population in subpopulation j, and $AP_P(T)_j$, $CP_P(T)_j$ and $TP_P(T)_j$ are T-year, chronic and transitory poverty indices, respectively, for subpopulation j.

Comparisons of poverty in various subpopulations are helpful in identifying the poorest groups. Such comparisons also suggest possible causes of poverty and its persistence. Subpopulations examined in this paper are those defined according to:

- (i) the race of the head of the household in which the individual resides in year T;
- (ii) the type of household (married-couple, single-parent, etc) in which the individual resides in year T; and
- (iii) the educational achievement of the head of the household in which the individual resides in year T.²²

After decomposing each of the poverty indices according to each of these characteristics separately, the indices are decomposed simultaneously according to all three criteria.

Although BLK and FGT have many desirable properties, the meaning of their numerical values, unlike that of the head-count ratio, is not intuitive. However, poverty intensity indices based upon BLK and FGT, which are readily interpretable, are easily computed for the various subpopulations.²³ In general, given any additively-decomposable poverty index, P, poverty intensity in subpopulation j equals the value of the poverty index for subpopulation j divided by the value of the poverty index for the entire population. T-year poverty intensity, $PI\{AP_P(T)_j\}$, chronic poverty intensity, $PI\{CP_P(T)_j\}$, and transitory poverty intensity, $PI\{TP_P(T)_j\}$, in subpopulation j, can all be calculated in this way. That is,

$$(15) \quad PI\{AP_P(T)_j\} = AP_P(T)_j / AP_P(T)$$

$$(16) \quad PI\{CP_P(T)_j\} = CP_P(T)_j / CP_P(T)$$

$$(17) \quad PI\{TP_P(T)_j\} = TP_P(T)_j / TP_P(T).$$

PI indices provide a measure of the intensity of poverty in subpopulation j relative to poverty within the entire population. A value greater (less) than one means that poverty in subpopulation j is more (less) intense than poverty in the entire population. In our experience, poverty intensity values, computed using different poverty indices, are remarkably similar and are insensitive to the choice of poverty line. Our results in this study are no exception.

5. DATA

The data used in this study come from the "1968-87 family-individual response file" of the Panel Study of Income Dynamics (PSID), conducted by the Survey Research Center (SRC) of the University of Michigan. The SRC has followed an initial set of 4,802 households (families and unrelated individuals)²⁴ and their descendants from 1968 until the present day. As family composition changed (spouses divorced and remarried; children left home and formed their own families etc), the number of households in the survey grew, reaching 7,061 by 1987, the most recent data available.

The 1968-87 family-individual response file is a panel data set in which the sampling units are the 20,487 persons living in the 7,061 households which were interviewed in 1987. Of these people 15,270 were members, or are direct descendants of members, of the original 1968 households. They are referred to as "sample members". The other 5,217 people have joined the households of sample members and are called "nonsample members". When appropriate weighting procedures are applied, sample members are representative of the United States population except for immigration since 1968. Information about each person and the

household to which he or she belongs has been recorded for all years during which the individual participated in the survey. Some of the information collected, including that on income and needs, refers to the year preceding that in which the interview was held.²⁵ Hence, in our study, all income periods end with the year 1986.

Chronic and transitory poverty are analyzed using all "sample members", except 182 such individuals who were temporarily absent from the survey during the period 1977-86.²⁶ This left 15,088 sample members who were present continuously in a "PSID family unit" from 1977, or birth, up to and including the time of the 1987 interview. The definition of household income used in this study consists of income from labor and capital assets, transfer income, lump-sum receipts (insurance payouts, inheritances etc), and the value of food stamps received. PSID estimates of federal taxes were subtracted from gross income to give disposable income. (See Appendix A for a detailed definition of household income.) The definition of household needs is that employed by the PSID.²⁷ Both incomes and needs were expressed in 1967 dollars using the consumer price index. The real interest rates used in computing the MSACEs are the savings account interest rate (= savings rate) and the credit card interest rate (= borrowing rate), net of the annual rate of inflation as measured by the consumer price index.²⁸

6. RESULTS

Tables 3 through 6 present T-year poverty indices and chronic poverty indices, together with their corresponding poverty intensity indices. The income periods range from one (1986) through ten (1977-86) years. Also presented is

chronic poverty expressed as a percentage of T-year poverty. Transitory poverty is not reported because it is readily computed as the difference between T-year poverty and chronic poverty. Parts A, B and C of each table are based upon BLK, FGT and H, respectively.

The first column of Tables 3 through 6 gives poverty in the entire United States population. As expected, the choice of income period affects the outcome of the poverty measurement process. In particular, poverty measured over the traditionally-used, one-year income period differs from poverty measured over longer income periods. T-year poverty, measured by BLK or FGT, is largest over the periods 1985-86 and 1984-86, and declines as the income period is extended backwards to 1977-86.²⁹ Chronic poverty indices fall monotonically as the income period is extended from one through ten years.³⁰ The rate of decrease in chronic poverty, based upon BLK or FGT, is rapid initially but then slows. With a 1982-86 income period, chronic poverty is about half its 1986 value and, with 1977-86 as the income period, chronic poverty is about one third of its 1986 value. The proportion of poverty which is chronic falls from approximately 0.58 (BLK) or 0.69 (FGT) when T=2 to about 0.38 when T=10. (We note, in passing, that results based upon H are quite different from those based upon BLK and FGT.) These results suggest that, whatever the conceptually-appropriate income period really is, at least one third of the poverty in the U.S. is chronic and no more than two thirds is transitory. The prevalence of chronic poverty, as measured in this paper, far exceeds that measured with tabulation and duration studies.³¹

In Table 3 poverty is decomposed by the race of the 1986 household head. The samples from the last three groups (Native American, Asian & Pacific Islander and Others) are too small to make reliable inferences about their

poverty, but the economic status of Whites and African Americans is clear enough. African Americans are not only much poorer than Whites they are also much more chronically poor than Whites, regardless of the income period employed. The poverty intensity indices reveal that, while T-year poverty among African Americans is two to three times as intense as T-year poverty in the entire population, chronic poverty among African Americans is three to four times as intense as chronic poverty in the whole population, depending on the length of the income period used. Furthermore, the longer the income period, the more intense is chronic poverty of African Americans, and the less intense is chronic poverty of Whites, relative to chronic poverty in the whole population. This occurs because, as T increases, chronic poverty of African Americans falls more slowly, and White chronic poverty falls more rapidly, than chronic poverty in the entire population. For any given income period, a larger proportion of poverty is chronic among African Americans than among Whites. For example, with a two-year income period, approximately 48 (BLK) to 61 (FGT) percent of poverty among Whites is chronic, whereas for African Americans the percentage is about 80 percent. With a ten-year income period, about 25 percent of White poverty is chronic, whereas about 56 to 61 percent of African American poverty is chronic. These results suggest that race is an important identifier of chronic poverty as well as total poverty.

Table 4 contains a decomposition of poverty according to the type of household in which the individual was residing in 1986. Five types of household are considered: unrelated individuals 65 or older, unrelated individuals younger than 65 years, married-couples with or without children, families headed by a male with no spouse present, and families headed by a female with no spouse present.

The most salient feature of Table 4 is the high degree of chronic poverty among people who were living in female-headed families in 1986. Chronic poverty for this group is about 3 to 4 times as intense as chronic poverty in the whole population. Furthermore, as the income period is extended, chronic-poverty intensity among those in female-headed families increases from about 3.5 when $T = 2$ to about 4.2 when $T = 10$. With a two-year income period, somewhere between 71 (FGT) and 79 (BLK) percent of these people's poverty is chronic and, with $T = 10$, the percentage remains in the range of 55 (FGT) to 60 (BLK) percent.

A second interesting feature of Table 4 is the different nature of poverty among elderly, unrelated individuals and unrelated individuals who are younger than 65. Surprisingly perhaps, poverty, as measured by BLK and FGT, is higher for the younger group, than for the older group, of unrelated individuals. This is so (with four exceptions) regardless of whether inter-year income transfers are permitted, and for any of the income periods considered. Part C of Table 4, which uses the head-count ratio, gives the opposite results. So we see that H can be misleading; although a larger percentage of elderly, unrelated individuals have incomes below the poverty line, the severity of their poverty, as measured by BLK and FGT, is less than that of other unrelated, individuals. However, as T increases, chronic poverty intensity, measured by either BLK, FGT or H, tends to decrease for other, unrelated individuals.

For all of the income periods considered, elderly, unrelated individuals have a higher proportion of chronic poverty than any other group. For example, with $T = 2$, more than 86 percent of poverty among elderly, unrelated individuals is chronic; with $T = 10$, about 62 (FGT) to 66 (BLK) percent of their poverty is

chronic. With an income period of two or three years, a large proportion of poverty among non-elderly, unrelated individuals is chronic poverty, but with longer income periods the proportion falls to a level similar to that of the whole population. These results suggest that the type of poverty experienced by elderly, and nonelderly, unrelated individuals is different and that the ability to smooth income over periods of four or more years is likely to help the nonelderly much more than the elderly.

In summary, the results in Table 4 suggest that, whatever the value of T, the type of household in which the individual was residing at the end of the income period is associated with both total and chronic poverty. The poverty of elderly, unrelated individuals and people living in female-headed families is more chronic in nature than the poverty of people living in other types of household.

Poverty is decomposed in Table 5 by the educational level of the head of the household in which the individual was residing in 1986. The category "12th+ grade" refers to those with a high-school diploma and some additional nonacademic qualification. The other categories are self-explanatory. Whatever the length of the income period, and regardless of ability to transfer income between years, poverty is virtually nonexistent among those with a college degree. Perhaps more important, however, is the association between the lack of a high-school diploma (that is, the lack of education to the twelfth grade) and poverty. For any given income period, T-year poverty among those with less than twelve grades of education is about 1.5 to 2 times as intense as T-year poverty in the population as a whole. Chronic poverty for this group is about 2.5 times as intense as chronic poverty in the entire population. T-year and chronic poverty among those

with a high-school diploma (but no higher qualification) are both about as intense as poverty in the whole population, for all values of T. Clearly, the level of education of the head of the household in which the individual was residing at the end of the income period is an important identifier of both chronic and total poverty.

The persistent nature of poverty among those living in households headed by the least educated members of the population is further reflected in the rising chronic poverty intensity indices for the two groups with no high-school diploma as the length of the income period increases. Chronic poverty intensity for all other groups decreases as the income period is extended. Furthermore, for any value of T, the proportion of poverty which is chronic increases as the level of education falls. For example, with T=10 the proportion of poverty which is chronic ranges from about four percent (for those with a college degree) to more than 60 percent (for those with eight or fewer grades of education). Those living in households where the head has less than a high-school diploma, experience poverty which is primarily chronic in nature. Whatever poverty is experienced by those in households where the head has at least a high-school diploma is primarily transitory in nature.

Finally, in Table 6, poverty is decomposed simultaneously according to type of household in 1986, race and educational achievement of the head of the household in 1986. First, some observations will be made about the level of poverty, irrespective of the length of the income period over which it is measured and regardless of whether inter-year income transfers are permitted. With race and household type held constant, the level of poverty is much higher for those residing in households where the 1986 head had no high-school diploma

than for those in households the head of which had twelve or more years of education. With race and education held constant, poverty is much higher in female-headed families than in other types of household. With the type of household and education held constant, poverty among African Americans is much higher than poverty among other races. These results suggest that race, type of household and education of the head of the household are all important identifiers of poverty.

We note that decompositions based on a single characteristic can be misleading. For example, not all subpopulations involving female-headed families have high poverty index values. Poverty among families headed by women who are not African American, and have at least a high-school diploma, is no more intense than poverty in the entire population. Similarly, the absence of a high-school diploma is not necessarily accompanied by poverty. Among households which are not female-headed families, and which are headed by non-African Americans with no high-school diploma, poverty is about as intense as poverty in the whole population. On the other hand, being African American is highly associated with poverty. Even among African-American-headed households which are not female-headed families, and where the head has at least a high-school diploma, poverty is more intense than in the population as a whole.

The most chronically poor group by far is comprised of people living in families headed by an African-American female with no high-school diploma. With an income period of five or more years, chronic poverty in this group is about ten times as intense as poverty in the entire population; with a ten-year income period, about twelve times as intense! With a ten-year income period, about 69 (FGT) to 76 (BLK) percent of poverty experienced by this group is chronic, rather

than transitory. In contrast, with a ten-year income period, only about ten percent of poverty experienced by those living in households which are not female-headed families, the head of which is a non-African American with a high-school diploma (the least poor group) is chronic poverty; the remaining 90 percent is transitory in nature.

Other groups with high levels of chronic poverty are: female-headed families, headed by an African American with a high-school diploma; female-headed families, headed by a non-African American with no high-school diploma; and other households headed by an African-American without a high-school diploma. The least amount of chronic poverty is to be found among households (female-headed families or otherwise) in which the head is not African-American and has a high-school diploma.

7. SUMMARY AND CONCLUSIONS

In this paper we have proposed a method for analyzing the chronic and transitory components of poverty using longitudinal income data. Aggregate poverty over T years, $AP_p(T)$, is defined as a weighted average of T annual poverty indices, P_t ($t=1,2,\dots,T$), where the weights facilitate adjustment for changes in the size and composition of the observed population. $AP_p(T)$ is the sum of a chronic and a transitory component. We advocate that P be a decomposable poverty index which reflects the severity, as well as the incidence, of poverty. From the set of such indices we chose to use Blackburn's index (BLK) and Foster, Greer and Thorbecke's index (FGT) because of their desirable properties.

Chronic poverty, $CP_P(T)$, is measured by the value of P when each individual in the population is assumed to earn an annual income equal to the maximum annual level of consumption which can be sustained by his or her "actual" income stream over the chosen T -year period. A person's "actual" income in any given year is defined as the adult equivalent income of the household to which the individual belongs. The maximum sustainable annual consumption expenditure is calculated taking into account realistic borrowing and savings interest rates which may vary through time. Although we have assumed that all people face the same interest rates, the methodology can easily be adapted to allow interest rates to vary among people. For example, borrowing rates could be made a decreasing function of a person's income level. The assumption that agents make inter-year income transfers is unrealistic only if events such as marital disruption deny agents access to savings from income earned in previous years. To this extent our results underestimate the amount of poverty which is chronic. Transitory poverty, $TP_P(T) = AP_P(T) - CP_P(T)$, is the amount of measured poverty which disappears when inter-year income transfers occur. Like P , $CP_P(T)$ and $TP_P(T)$ are additively decomposable, a property which allows chronic and transitory poverty intensity to be calculated for various subpopulations.

Previous measures of chronic poverty, from tabulation and duration studies, are critically evaluated in the paper. These studies disregard saving and borrowing between years and view chronic poverty as a 0-1 condition which lasts for many consecutive years. Like the head-count ratio on which they are based, these studies completely ignore the depth of poverty. Our measure of chronic poverty, which is in the spirit of the theories of life-cycle consumption and savings behavior, reflects the severity as well as the duration of poverty.

We apply our method to PSID data covering income periods of one (1986) through ten (1977-86) years. Our results indicate that at least one third of measured poverty in the United States can be regarded as chronic, a much larger amount than that found by previous research. When the T-year and chronic poverty indices are decomposed according to various characteristics of population members we find that those segments of society which are poorest according to cross-section data are also the most chronically poor. Institutions which enable individuals to save and borrow can have an effect on transitory poverty, but not on chronic poverty. We infer from our results that improved access to such institutions could help reduce the poverty of the least poor groups defined in our study (since their poverty is largely transitory) but would be less effective in reducing the poverty of the poorest groups (since their poverty is largely chronic).

A meaningful picture of chronic poverty in the United States can be constructed in terms of race, education and household structure. The poorest group was found to be people living in families headed by an African-American female with no high-school diploma. Chronic poverty for this group was almost twelve times as intense as chronic poverty in the entire population. Between 1977 and 1986 about 70 percent of poverty among these people was chronic. More generally, poverty among people living in female-headed families is both high and chronic, unless the woman heading the family is not an African American and has a high-school diploma. Poverty among individuals living in households where the head has less than a twelfth-grade education is also high and chronic, unless the household is not a female-headed family and its head is not an African American. Regardless of the type of household and the educational level of its

head, poverty among African Americans is high compared with poverty in the entire population. However, the poverty of African Americans living in households which are not female-headed families, and where the head has a high-school diploma, is of a more transitory nature than poverty among other African Americans.

A final methodological note is appropriate. It is not surprising that the two indices advocated in this paper, BLK and FGT, yield similar results; they satisfy similar axioms. The head-count ratio, H, which is axiomatically inferior, yields results which are out of line. Not only can H produce deceptive results regarding the extent of, and changes in, poverty, it can also be used to intentionally mislead. We strongly advocate that its use be discontinued.

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FOOTNOTES

1. Throughout this paper we assume that income is an adequate measure of economic welfare. Undoubtedly, economic welfare encompasses more than income but, given the nature of the available data, income is arguably the best practical measure of economic welfare we have.

2. The "underclass" is discussed, for example, by Auletta (1982) and Wilson (1987). The earlier and related concept of a "culture of poverty" had been expounded, for example, by Harrington (1962) and Lewis (1966).

3. Rainwater (1981, p.5) is very critical of researchers who assume that annual income is the appropriate measure of poverty: "Because the entire administrative apparatus of the American antipoverty programs is predicated on that assumption, policy researchers have tended not to question it, or even to be aware of the fact that it is an assumption." Ruggles and Williams (1989) are a good example. Although they use monthly rather than annual income, their choice of income period is based on eligibility requirements for means-tested programs.

4. The advantages of using an additively-decomposable poverty index will be discussed in Section 4.

5. For example, if an agent has income {10, 100} over two years, then, at a zero interest rate, the annuity is 55; if the interest rate is ten percent, the annuity is $(1.1 \times 10 + 100) / (1.1 + 1) = 52.857$.

6. The transfer axiom states that an aggregate poverty index should decrease (increase) when income is transferred from one person to another with less (no less) income, ceteris paribus (Sen, 1976).

7. The arbitrary nature of the poverty line is well recognized. See, for example, Harrington (1984, p.70-71); Bane and Ellwood (1986, p.7); Mayer and Jencks (1989, pp.101-7); Blackburn (1990, p.54); Ruggles (1990).

8. Ruggles and Williams (1989) use monthly data from the Survey of Income and Program Participation (SIPP) and report the percentage of the population that had at least one month when family incomes were below the monthly poverty threshold. The value of such information is questionable; at various times the authors have satisfied Ruggles and Williams' definition of poverty.

9. Note that a summary statistic from tabulation studies, the proportion of periods in poverty averaged over all persons in the sample, equals $AP_H(T)$, which we have seen from Table 1 is unable to make important distinctions about the nature of poverty.

10. In Duncan et. al.'s (1984) study, the percentage of the population defined as persistently poor almost doubled when the poverty line was increased by 25 percent.

11. Duration studies sometimes use a stricter definition of a poverty spell in order to avoid spells which are merely statistical artifacts. For example, income may be required to drop by a certain percentage as well as fall below the poverty line in order to signal the beginning of a poverty spell. Such adjustments are themselves quite arbitrary. Multiple poverty spells and their relationship to chronic poverty are not handled well by duration studies.

12. For those who would argue that the poor face higher interest rates on borrowing and lower interest rates on saving than the rest of society, our

methodology can accommodate their view by allowing interest rates to be a function of income.

13. Consuming out of past savings is one explanation of why annual expenditures exceed annual incomes. Another explanation is that the poor underreport their income. See Mayer and Jencks (1989, p.109).

14. Ruggles and Williams (1989) use SIPP data and attempt to include financial assets in the resource base.

15. See Donaldson and Weymark (1986), Blackburn (1989) and Rodgers & Rodgers (1991) for discussions of the properties of poverty indices.

16. In principle, this complication also occurs with a one-year income period. However, because more than one observation is required to observe a change in household structure, in practice, the problem is ignored when a one-year income period is employed.

17. According to this method, which was suggested by Blackorby and Donaldson (1979), an individual's income-to-needs ratio equals the income-to-needs ratio of the household in which he or she resides.

18. The population of interest could be defined as all persons who were present at some time during the income period, or, alternatively, as all persons who were present in all years during the income period. Our definition is more representative of the current U.S. population.

19. $AP_{BLK}(T)$ and $AP_{FGT}(T)$ satisfy transfer axioms involving inter-year income transfers as well as interpersonal income transfers. It seems reasonable that

an income-equalizing, inter-year transfer should cause the T-year poverty index to decrease. Furthermore, since the chronic poverty index assumes that each agent has a completely smooth income stream over T years, it seems reasonable that the chronic poverty index, $CP_P(T)$, should not exceed the T-year poverty index, $AP_T(T)$. If all agents have constant income streams then $AP_P(T) = CP_P(T)$. Any additively-decomposable index which satisfies the interpersonal transfer axiom will also possess these inter-year transfer properties.

20. Since actual interest rates do vary through time, an assumption that r_t is constant is not an acceptable solution.

21. If T varies substantially among agents, there is no appropriate concept of T at the aggregate level. Of course, "no appropriate concept of T" is not the same as "T equals one year".

22. When T exceeds one year, many characteristics, such as the type of household in which an agent lives and the race and educational qualifications of the head of the household, can be observed to change through time. We decided to define subpopulations according to characteristics observed at the end of the income period. Our definition of subpopulations seems most compatible with the definition of the population of interest. Alternatively, individuals could have been assigned to subpopulations on the basis of some characteristic possessed during the entire income period, with individuals whose characteristic changed during the income period being placed in a separate, residual category. A disadvantage of the alternative approach is that the residual category is likely to contain the majority of observations.

23. See Rodgers and Rodgers (1991) for a discussion of measures of poverty intensity.

24. The PSID makes no distinction between families and unrelated individuals. A "PSID family" may consist of a single person. In this paper, the term "household" will be used to refer to both families and unrelated individuals, while the word "family" will be reserved for two or more people living together who are related by blood, marriage or adoption. Note that the Bureau of the Census defines the term "household" slightly differently.

25. For further information on the PSID, see Survey Research Center, 1987.

26. PSID income data for temporary absentees are unreliable.

27. The only change we made to the PSID's poverty thresholds was to multiply the poverty line for women living alone by 1.156, thereby giving these women the same needs standard as that of elderly men living alone (see Survey Research Center, 1987, p.D-5). PSID thresholds are 25 percent higher than those used by the Bureau of the Census. When PSID thresholds are reduced by 25 percent PSID estimates of poverty rates are consistently lower than official poverty rates, a fact which has been discussed by others (Minarik, 1975; Duncan, 1984, p.40; Bane and Ellwood, 1986, p.6).

28. Prior to April 1, 1986 maximum interest rates were imposed on time and savings deposits at federally insured institutions. In this paper it is assumed that agents can save at the savings account interest rate and borrow at a rate 12.94 percentage points higher than they can save. 12.94 is the mean difference between the savings account interest rate and the credit card interest rate for

the period 1980-86, the longest period during which both rates were published. Nominal interest rates were extracted from various issues of the Federal Reserve Bulletin, Board of Governors of the Federal Reserve System, Washington, D.C.. The consumer price index used to deflate nominal incomes and interest rates is the CPI-U-X1 (U.S. Department of Commerce, 1990). The CPI-U-X1 provides a consistent treatment of housing costs over the income periods considered in this paper. The nominal savings rate and CPI-U-X1 (with base: 1967=100) are as follows:

YEAR	INTEREST RATE	CPI	YEAR	INTEREST RATE	CPI	YEAR	INTEREST RATE	CPI
1976	5.00	163.5	1980	5.25	226.4	1984	5.50	285.8
1977	5.00	173.9	1981	5.25	248.0	1985	5.50	296.0
1978	5.00	185.8	1982	5.25	263.2	1986	5.50	301.1
1979	5.25	203.6	1983	5.25	274.1			

29. This pattern is not entirely consistent with the official poverty rate among individuals in the U.S.. Between 1977 and 1986, the official poverty rate was highest in 1983 and 1982 (see, for example, U.S. Dept of Commerce, Bureau of the Census, 1990). The inconsistency results from our use of BLK and FGT and the use of H by the Bureau of the Census. The T-year head-count ratios reported in the first column of Part C of Tables 3 through 6 follow a pattern which is consistent with the official poverty statistics.

30. Although $CP_{BLK}(T)$ and $CP_{FGT}(T)$ for the entire U.S. population are both observed to decrease as T increases, this is not a mathematical property of these indices. Indeed, columns 5 and 6 of Table 3 provide two examples where the chronic poverty indices increase as T increases from 4 to 5. It is easy to construct hypothetical cases where $CP_p(T)$ is not monotonically decreasing in T.

31. Duncan et. al. (1984), using a different methodology to ours, found that nearly 25 percent of the U.S. population experienced at least one year of poverty between 1969 and 1978, although the percentage in prolonged poverty (eight or more years out of ten) was less than three percent and was largely confined to African Americans, the elderly, those living in rural areas and those living in the South. In an attempt to reconcile our results with Duncan's we made some estimates, based on his reported results. On average, individuals were poor for approximately 8.3 percent of years from 1969 through 1978. In comparison, our results in Part C of Tables 3 through 6, based on poverty thresholds 25 percent higher than those used by Duncan, indicate that, on average, individuals were poor for approximately 9.8 percent of years from 1977 through 1986.

TABLE 1

Examples of Chronic and Transitory Poverty*

Case 1:

<u>Agent</u>	<u>Year 1 Income</u>	<u>Year 2 Income</u>	<u>MSACE</u>
A	10	10	10.000
B	10	100	52.857
C	100	100	100.000

Poverty in Year 1, $H_1 = 0.67$
 Poverty in Year 2, $H_2 = 0.33$

2-Year Poverty, $AP_H(2) = 0.50$
 2-year Chronic Poverty, $CP_H(2) = 0.33$
 2-Year Transitory Poverty, $TP_H(2) = 0.17$

Case 2:

<u>Agent</u>	<u>Year 1 Income</u>	<u>Year 2 Income</u>	<u>MSACE</u>
X	10	100	52.857
Y	10	100	52.857
Z	100	10	57.143

Poverty in Year 1, $H_1 = 0.67$
 Poverty in Year 2, $H_2 = 0.33$

2-Year Poverty, $AP_H(2) = 0.50$
 2-year Chronic Poverty, $CP_H(2) = 0.00$
 2-Year Transitory Poverty, $TP_H(2) = 0.50$

* Based on the head-count ratio, a poverty line of 50 and an interest rate of 10 percent.

TABLE 2

Three Examples of the Maximum, Sustainable, Consumption Level

<u>Year</u>	<u>Example 1</u>	<u>Example 2</u>	<u>Example 3</u>
1. Opening balance*	0.00	0.00	0.00
Interest on previous year's closing balance	0.00	0.00	0.00
Income	1000.00	100.00	550.00
Expenditure	-412.80	-348.07	-393.38
Closing balance**	587.20	-248.07	156.62
2. Opening balance	587.20	-248.07	156.62
Interest on previous year's closing balance	23.49	-47.13	6.26
Income	100.00	100.00	100.00
Expenditure	-412.80	-348.07	-393.38
Closing balance**	297.89	-543.27	-130.50
3. Opening balance	297.89	-543.27	-130.50
Interest on previous year's closing balance	14.89	-108.65	-26.10
Income	100.00	1000.00	550.00
Expenditure	-412.80	-348.07	-393.38
Closing balance**	-0.02	0.01	0.02
Maximum, Sustainable Consumption Level	412.80	348.07	393.38
Average Annual Income	400.00	400.00	400.00

*. The opening balance in year 1 could be set equal to wealth at the beginning of the income period if the latter were known.

**.. A positive closing balance indicates saving; a negative closing balance indicates borrowing.

TABLE 3
 Post-Transfer, Post-Tax Poverty and Poverty Intensity in the 1987 U.S. Population,
 Decomposed by Race of Individual,
 Measured over Income Periods of Different Lengths

Income Period	Aggregate Poverty						Aggregate Poverty Intensity				
	Total	Race of Individual*					Race of Individual*				
		(1)	White (2)	African American (3)	Native American (4)	Asian & Pac Isl (5)	Others (6)	White (7)	African American (8)	Native American (9)	Asian & Pac Isl (10)
A. Blackburn's Index											
T-Year Poverty, $AP_{BLK}(T)$						T-Year Poverty Intensity, $AP_{BLK}(T)_j$					
1986	0.057	0.040	0.176	0.056	0.009	0.030	0.706	3.090	0.988	0.163	0.533
85-86	0.072	0.057	0.183	0.057	0.010	0.040	0.789	2.541	0.794	0.136	0.552
84-86	0.072	0.057	0.181	0.057	0.008	0.041	0.792	2.530	0.796	0.114	0.578
83-86	0.067	0.052	0.176	0.059	0.010	0.044	0.775	2.642	0.894	0.143	0.659
82-86	0.064	0.049	0.179	0.053	0.012	0.049	0.756	2.781	0.826	0.186	0.761
77-86	0.053	0.039	0.157	0.045	0.011	0.051	0.735	2.955	0.844	0.213	0.955
Chronic Poverty, $CP_{BLK}(T)$						Chronic Poverty Intensity, $CP_{BLK}(T)_j$					
1986	0.057	0.040	0.176	0.056	0.009	0.030	0.706	3.090	0.988	0.163	0.533
85-86	0.042	0.027	0.146	0.050	0.009	0.036	0.645	3.489	1.189	0.215	0.853
84-85	0.034	0.020	0.126	0.048	0.007	0.030	0.608	3.735	1.437	0.210	0.888
83-86	0.030	0.017	0.118	0.044	0.007	0.027	0.574	3.969	1.481	0.246	0.899
82-86	0.028	0.015	0.118	0.038	0.008	0.034	0.544	4.167	1.346	0.285	1.197
77-86	0.021	0.010	0.096	0.016	0.004	0.018	0.481	4.641	0.760	0.201	0.885
Proportion of Poverty that is Chronic											
1986	1.000	1.000	1.000	1.000	1.000	1.000					
85-86	0.581	0.475	0.798	0.870	0.916	0.898					
84-86	0.470	0.361	0.695	0.849	0.864	0.723					
83-86	0.447	0.331	0.672	0.741	0.768	0.610					
82-86	0.438	0.316	0.657	0.714	0.672	0.690					
77-86	0.387	0.253	0.609	0.349	0.367	0.359					
B. Foster, Greer and Thorbecke's Index											
T-Year Poverty, $AP_{FGT}(T)$						T-Year Poverty Intensity, $AP_{FGT}(T)_j$					
1986	0.016	0.010	0.052	0.014	0.002	0.008	0.667	3.364	0.889	0.142	0.527
85-86	0.018	0.013	0.055	0.014	0.002	0.011	0.709	3.089	0.794	0.120	0.625
84-86	0.017	0.012	0.054	0.013	0.002	0.012	0.708	3.105	0.747	0.096	0.685
83-86	0.017	0.012	0.053	0.012	0.002	0.013	0.705	3.132	0.736	0.107	0.749
82-86	0.017	0.012	0.054	0.011	0.003	0.014	0.699	3.184	0.665	0.153	0.846
77-86	0.014	0.010	0.047	0.011	0.003	0.016	0.688	3.289	0.744	0.212	1.093
Chronic Poverty, $CP_{FGT}(T)$						Chronic Poverty Intensity, $CP_{FGT}(T)_j$					
1986	0.016	0.010	0.052	0.014	0.002	0.008	0.667	3.364	0.889	0.142	0.527
85-86	0.012	0.008	0.045	0.012	0.002	0.008	0.623	3.663	0.948	0.159	0.693
84-86	0.010	0.006	0.038	0.010	0.001	0.008	0.591	3.879	0.976	0.135	0.780
83-86	0.009	0.005	0.035	0.008	0.001	0.006	0.563	4.079	0.964	0.161	0.661
82-86	0.008	0.004	0.035	0.007	0.002	0.008	0.526	4.323	0.802	0.201	0.928
77-86	0.006	0.003	0.026	0.002	0.001	0.005	0.467	4.747	0.423	0.097	0.924
Proportion of Poverty that is Chronic											
1986	1.000	1.000	1.000	1.000	1.000	1.000					
85-86	0.690	0.606	0.818	0.823	0.913	0.765					
84-86	0.563	0.470	0.703	0.735	0.794	0.641					
83-86	0.511	0.408	0.665	0.669	0.767	0.451					
82-86	0.482	0.363	0.654	0.581	0.632	0.529					
77-86	0.384	0.261	0.555	0.219	0.176	0.325					
Sample	15088	8871	5899	78	68	100					
Σ weights	284729	243893	35443	1027	1693	1925					
Percentage	100.00	85.66	12.45	0.36	0.59	0.68					

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TABLE 3 - continued

Post-Transfer, Post-Tax Poverty and Poverty Intensity in the 1987 U.S. Population,
Decomposed by Race of Individual,
Measured over Income Periods of Different Lengths

Income Period	Aggregate Poverty					Aggregate Poverty Intensity					
	Total	Race of Individual*				Race of Individual*					
		White	African American	Native American	Asian & Pac Isl	Others	White	African American	Native American	Asian & Pac Isl	Others
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	
C. Head-Count Ratio											
T-Year Poverty, $AP_H(T)$						T-Year Poverty Intensity, $AP_H(T)_j$					
1986	0.102	0.069	0.333	0.217	0.039	0.104	0.671	3.259	2.127	0.382	1.023
85-86	0.106	0.074	0.332	0.197	0.043	0.124	0.691	3.125	1.851	0.408	1.169
84-86	0.105	0.072	0.331	0.217	0.040	0.117	0.688	3.162	2.077	0.379	1.114
83-86	0.106	0.073	0.331	0.270	0.048	0.125	0.691	3.134	2.549	0.457	1.183
82-86	0.106	0.073	0.333	0.237	0.051	0.131	0.693	3.138	2.236	0.478	1.232
77-86	0.098	0.068	0.312	0.174	0.041	0.142	0.693	3.189	1.781	0.423	1.450
Chronic Poverty, $CP_H(T)$						Chronic Poverty Intensity, $CP_H(T)_j$					
1986	0.102	0.069	0.333	0.217	0.039	0.104	0.671	3.259	2.127	0.382	1.023
85-86	0.100	0.065	0.333	0.217	0.039	0.140	0.655	3.342	2.181	0.392	1.409
84-86	0.089	0.055	0.319	0.247	0.031	0.090	0.620	3.595	2.783	0.346	1.017
83-86	0.089	0.055	0.319	0.233	0.031	0.147	0.617	3.586	2.614	0.345	1.652
82-86	0.086	0.052	0.321	0.247	0.031	0.139	0.599	3.723	2.868	0.363	1.609
77-86	0.072	0.039	0.306	0.120	0.031	0.065	0.536	4.224	1.652	0.432	0.896
Proportion of Poverty that is Chronic**											
1986	1.000	1.000	1.000	1.000	1.000	1.000					
85-86	0.936	0.888	1.001	1.103	0.899	1.128					
84-86	0.849	0.765	0.965	1.138	0.775	0.775					
83-86	0.842	0.752	0.963	0.863	0.636	1.175					
82-86	0.814	0.703	0.965	1.044	0.618	1.062					
77-86	0.742	0.574	0.983	0.688	0.758	0.458					
Sample	15088	8871	5899	78	68	100					
Σ weights	284729	243893	35443	1027	1693	1925					
Percentage	100.00	85.66	12.45	0.36	0.59	0.68					

Source: PSID, Individual-Response File, 1987. Based on individuals present in the PSID family unit in 1987.

The total includes 728 (Σ weights = 748, 0.26%) individuals with unknown race.

*. Sample sizes for Native Americans, Asian and Pacific Islanders and Other Races are too small to provide reliable information.

**.. Since the head-count ratio violates the transfer axiom the proportion of poverty which is chronic can exceed one. This demonstrates an undesirable feature of the head-count ratio.

TABLE 4

Post-Transfer, Post-Tax Poverty and Poverty Intensity in the 1987 U.S. Population,
Decomposed by Type of Household in 1986,
Measured over Income Periods of Different Lengths

Income Period	Aggregate Poverty						Aggregate Poverty Intensity				
	Total (1)	Type of Household in 1986					Type of Household in 1986				
		Indiv'l ge 65 (2)	Indiv'l lt 65 (3)	Married Couple (4)	Male-Hd Family (5)	Female-Hd Family (6)	Indiv'l ge 65 (7)	Indiv'l lt 65 (8)	Married Couple (9)	Male-Hd Family (10)	Female-Hd Family (11)
A. Blackburn's Index											
T-Year Poverty, $AP_{BLK}(T)$						T-Year Poverty Intensity, $AP_{BLK}(T)_j$					
1986	0.057	0.075	0.149	0.027	0.061	0.160	1.325	2.619	0.481	1.066	2.811
85-86	0.072	0.081	0.133	0.042	0.077	0.204	1.132	1.846	0.581	1.066	2.833
84-86	0.072	0.077	0.134	0.044	0.068	0.189	1.073	1.874	0.617	0.954	2.638
83-86	0.067	0.072	0.126	0.040	0.061	0.177	1.082	1.901	0.609	0.915	2.667
82-86	0.064	0.067	0.122	0.039	0.057	0.174	1.046	1.884	0.610	0.880	2.690
77-86	0.053	0.066	0.088	0.034	0.051	0.141	1.240	1.653	0.632	0.958	2.659
Chronic Poverty, $CP_{BLK}(T)$						Chronic Poverty Intensity, $CP_{BLK}(T)_j$					
1986	0.057	0.075	0.149	0.027	0.061	0.160	1.325	2.619	0.481	1.066	2.811
85-86	0.042	0.072	0.088	0.018	0.030	0.144	1.732	2.114	0.422	0.708	3.450
84-85	0.034	0.064	0.071	0.013	0.017	0.122	1.910	2.098	0.392	0.512	3.617
83-86	0.030	0.058	0.055	0.011	0.016	0.115	1.941	1.841	0.381	0.524	3.855
82-86	0.028	0.052	0.048	0.011	0.016	0.113	1.822	1.714	0.378	0.553	3.993
77-86	0.021	0.044	0.025	0.008	0.017	0.085	2.114	1.226	0.396	0.823	4.109
Proportion of Poverty that is Chronic											
1986	1.000	1.000	1.000	1.000	1.000	1.000					
85-86	0.581	0.889	0.666	0.422	0.386	0.708					
84-86	0.470	0.838	0.527	0.299	0.253	0.645					
83-86	0.447	0.803	0.433	0.280	0.256	0.647					
82-86	0.438	0.764	0.399	0.272	0.275	0.651					
77-86	0.387	0.661	0.287	0.243	0.333	0.599					
B. Foster, Greer and Thorbecke's Index											
T-Year Poverty, $AP_{FGT}(T)$						T-Year Poverty Intensity, $AP_{FGT}(T)_j$					
1986	0.016	0.021	0.041	0.007	0.020	0.048	1.327	2.649	0.424	1.315	3.083
85-86	0.018	0.022	0.038	0.008	0.020	0.057	1.240	2.119	0.470	1.156	3.245
84-86	0.017	0.020	0.038	0.009	0.020	0.054	1.168	2.176	0.492	1.147	3.100
83-86	0.017	0.019	0.035	0.009	0.018	0.051	1.114	2.105	0.512	1.067	3.056
82-86	0.017	0.017	0.034	0.009	0.017	0.051	1.030	2.022	0.532	0.993	3.039
77-86	0.014	0.017	0.025	0.008	0.014	0.042	1.163	1.727	0.579	1.000	2.941
Chronic Poverty, $CP_{FGT}(T)$						Chronic Poverty Intensity, $CP_{FGT}(T)_j$					
1986	0.016	0.021	0.041	0.007	0.020	0.048	1.327	2.649	0.424	1.315	3.083
85-86	0.012	0.019	0.030	0.004	0.009	0.045	1.557	2.426	0.350	0.768	3.693
84-86	0.010	0.016	0.024	0.003	0.005	0.038	1.586	2.459	0.326	0.487	3.852
83-86	0.009	0.013	0.018	0.003	0.004	0.034	1.570	2.123	0.344	0.491	3.991
82-86	0.008	0.012	0.016	0.003	0.004	0.034	1.476	2.008	0.336	0.519	4.143
77-86	0.006	0.010	0.008	0.002	0.005	0.023	1.860	1.378	0.370	0.859	4.229
Proportion of Poverty that is Chronic											
1986	1.000	1.000	1.000	1.000	1.000	1.000					
85-86	0.690	0.866	0.790	0.514	0.458	0.785					
84-86	0.563	0.764	0.636	0.372	0.239	0.699					
83-86	0.511	0.720	0.515	0.343	0.235	0.667					
82-86	0.482	0.691	0.479	0.304	0.252	0.657					
77-86	0.384	0.615	0.307	0.245	0.330	0.553					
Sample	15088	385	1211	10081	311	3065					
Σ weights	284729	10847	25308	207577	5450	35043					
Percent	100.00	3.81	8.89	72.90	1.91	12.31					

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TABLE 4 - continued

Post-Transfer, Post-Tax Poverty and Poverty Intensity in the 1987 U.S. Population,
Decomposed by Type of Household in 1986,
Measured over Income Periods of Different Lengths

Income Period	Aggregate Poverty					Aggregate Poverty Intensity					
	Total (1)	Type of Household in 1986				Type of Household in 1986					
		Indiv'l ge 65 (2)	Indiv'l lt 65 (3)	Married Couple (4)	Male-Hd Family (5)	Female-Hd Family (6)	Indiv'l ge 65 (7)	Indiv'l lt 65 (8)	Married Couple (9)	Male-Hd Family (10)	Female-Hd Family (10)
C. Head-Count Ratio											
T-Year Poverty, $AP_H(T)$						T-Year Poverty Intensity, $AP_H(T)_j$					
1986	0.102	0.271	0.140	0.050	0.091	0.333	2.652	1.372	0.491	0.892	3.264
85-86	0.106	0.282	0.140	0.054	0.109	0.339	2.649	1.318	0.507	1.021	3.184
84-86	0.105	0.277	0.134	0.054	0.097	0.335	2.645	1.280	0.513	0.924	3.198
83-86	0.106	0.265	0.132	0.057	0.095	0.330	2.507	1.250	0.536	0.895	3.124
82-86	0.106	0.256	0.131	0.058	0.095	0.328	2.415	1.233	0.548	0.901	3.097
77-86	0.098	0.232	0.112	0.057	0.095	0.291	2.375	1.142	0.579	0.976	2.984
Chronic Poverty, $CP_H(T)$						Chronic Poverty Intensity, $CP_H(T)_j$					
1986	0.102	0.271	0.140	0.050	0.091	0.333	2.652	1.372	0.491	0.892	3.264
85-86	0.100	0.285	0.125	0.050	0.084	0.322	2.863	1.255	0.499	0.840	3.239
84-86	0.089	0.284	0.111	0.040	0.052	0.308	3.194	1.247	0.452	0.582	3.468
83-86	0.089	0.257	0.105	0.041	0.051	0.315	2.884	1.181	0.463	0.575	3.543
82-86	0.086	0.227	0.100	0.041	0.062	0.305	2.638	1.158	0.477	0.715	3.532
77-86	0.072	0.187	0.069	0.035	0.052	0.266	2.582	0.945	0.483	0.716	3.670
Proportion of Poverty that is Chronic**											
1986	1.000	1.000	1.000	1.000	1.000	1.000					
85-86	0.936	1.012	0.892	0.921	0.771	0.952					
84-86	0.849	1.026	0.828	0.748	0.535	0.921					
83-86	0.842	0.968	0.796	0.726	0.541	0.954					
82-86	0.814	0.889	0.764	0.709	0.646	0.928					
77-86	0.742	0.807	0.614	0.618	0.545	0.913					
Sample	15088	385	1211	10081	311	3065					
Σ weights	284729	10847	25308	207577	5450	35043					
Percent	100.00	3.81	8.89	72.90	1.91	12.31					

Source: PSID, Individual-Response File, 1987. Based on individuals present in the PSID family unit in 1987.

The total includes 35 (Σ weights = 504, 0.18%) individuals with unknown type of household.

** Since the head-count ratio violates the transfer axiom the proportion of poverty which is chronic can exceed one. This demonstrates an undesirable feature of the head-count ratio.

TABLE 5

Post-Transfer, Post-Tax Poverty and Poverty Intensity in the 1987 U.S. Population,
Decomposed by Education of the Head in 1986,
Measured over Income Periods of Different Lengths

Income Period	Total	Education of Head in 1986						Education of Head in 1986					
		0-8 Grades (1)	9-11 Grades (2)	12th Grade (3)	12th+ Grade (4)	Coll No Deg (5)	Coll Degree (6)	0-8 Grades (8)	9-11 Grades (9)	12th Grade (10)	12th+ Grade (11)	Coll No Deg (12)	Coll Degree (13)
A. Blackburn's Index													
T-Year Poverty, $AP_{BLK}(T)$							T-Year Poverty Intensity, $AP_{BLK}(T)_j$						
1986	0.057	0.104	0.123	0.058	0.044	0.042	0.008	1.827	2.159	1.027	0.773	0.731	0.149
85-86	0.072	0.104	0.140	0.089	0.043	0.047	0.030	1.451	1.944	1.240	0.601	0.660	0.423
84-86	0.072	0.099	0.140	0.093	0.041	0.052	0.024	1.389	1.949	1.303	0.570	0.724	0.337
83-86	0.067	0.101	0.130	0.080	0.043	0.049	0.020	1.518	1.961	1.204	0.650	0.743	0.307
82-86	0.064	0.099	0.130	0.074	0.040	0.049	0.020	1.538	2.016	1.151	0.616	0.752	0.318
77-86	0.053	0.099	0.104	0.057	0.031	0.036	0.020	1.870	1.965	1.064	0.582	0.670	0.368
Chronic Poverty, $CP_{BLK}(T)$							Chronic Poverty Intensity, $CP_{BLK}(T)_j$						
1986	0.057	0.104	0.123	0.058	0.044	0.042	0.008	1.827	2.159	1.027	0.773	0.731	0.149
85-86	0.042	0.088	0.093	0.048	0.018	0.029	0.003	2.111	2.234	1.139	0.435	0.696	0.071
84-86	0.034	0.079	0.078	0.038	0.014	0.018	0.003	2.333	2.321	1.123	0.427	0.528	0.080
83-86	0.030	0.075	0.075	0.027	0.012	0.016	0.002	2.509	2.510	0.914	0.404	0.549	0.058
82-86	0.028	0.071	0.073	0.025	0.012	0.015	0.001	2.526	2.587	0.877	0.410	0.526	0.047
77-86	0.021	0.066	0.052	0.017	0.008	0.006	0.001	3.215	2.546	0.811	0.394	0.315	0.038
Proportion of Poverty that is Chronic													
1986	1.000	1.000	1.000	1.000	1.000	1.000	1.000						
85-86	0.581	0.846	0.668	0.534	0.421	0.613	0.098						
84-86	0.470	0.790	0.560	0.405	0.352	0.343	0.112						
83-86	0.447	0.739	0.572	0.340	0.278	0.330	0.085						
82-86	0.438	0.720	0.563	0.334	0.292	0.307	0.065						
77-86	0.387	0.666	0.502	0.295	0.262	0.182	0.040						
B. Foster, Greer and Thorbecke's Index													
T-Year Poverty, $AP_{FGT}(T)$							T-Year Poverty Intensity, $AP_{FGT}(T)_j$						
1986	0.016	0.030	0.033	0.017	0.011	0.011	0.002	1.908	2.155	1.075	0.728	0.718	0.105
85-86	0.018	0.031	0.038	0.020	0.011	0.012	0.004	1.729	2.135	1.140	0.598	0.679	0.242
84-86	0.017	0.029	0.038	0.021	0.010	0.011	0.004	1.684	2.163	1.185	0.595	0.657	0.213
83-86	0.017	0.029	0.036	0.018	0.011	0.012	0.003	1.726	2.169	1.087	0.624	0.734	0.197
82-86	0.017	0.029	0.037	0.018	0.010	0.012	0.004	1.706	2.201	1.048	0.606	0.724	0.237
77-86	0.014	0.029	0.030	0.014	0.008	0.009	0.005	2.033	2.083	0.975	0.562	0.638	0.333
Chronic Poverty, $CP_{FGT}(T)$							Chronic Poverty Intensity, $CP_{FGT}(T)_j$						
1986	0.016	0.030	0.033	0.017	0.011	0.011	0.002	1.908	2.155	1.075	0.728	0.718	0.105
85-86	0.012	0.026	0.028	0.014	0.005	0.008	0.001	2.100	2.286	1.130	0.421	0.678	0.074
84-86	0.010	0.022	0.024	0.010	0.004	0.005	0.001	2.232	2.408	1.066	0.422	0.553	0.097
83-86	0.009	0.020	0.022	0.008	0.003	0.005	0.001	2.349	2.588	0.953	0.361	0.547	0.060
82-86	0.008	0.019	0.022	0.007	0.003	0.004	0.000	2.364	2.666	0.914	0.354	0.540	0.043
77-86	0.006	0.018	0.014	0.005	0.002	0.002	0.000	3.217	2.572	0.844	0.322	0.301	0.038
Proportion of Poverty that is Chronic													
1986	1.000	1.000	1.000	1.000	1.000	1.000	1.000						
85-86	0.690	0.838	0.739	0.684	0.486	0.688	0.210						
84-86	0.563	0.746	0.626	0.506	0.400	0.474	0.256						
83-86	0.511	0.695	0.610	0.448	0.295	0.381	0.156						
82-86	0.482	0.668	0.584	0.420	0.282	0.359	0.088						
77-86	0.384	0.608	0.475	0.333	0.220	0.181	0.044						
Sample	15088	1800	3016	3308	1568	2938	2347						
Σ weights	284729	27052	44892	59923	31594	57625	62105						
Percent	100.00	9.50	15.77	21.05	11.10	20.24	21.81						

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TABLE 5 - continued

Post-Transfer, Post-Tax Poverty and Poverty Intensity in the 1987 U.S. Population,
Decomposed by Education of the Head in 1986,
Measured over Income Periods of Different Lengths

Income Period	Total	Education of Head in 1986						Education of Head in 1986					
		0-8 Grades (1)	9-11 Grades (2)	12th Grade (3)	12th+ Grade (4)	Coll No Deg (5)	Coll Degree (6)	0-8 Grades (8)	9-11 Grades (9)	12th Grade (10)	12th+ Grade (11)	Coll No Deg (12)	Coll Degree (13)
C. Head-Count Ratio													
T-Year Poverty, $AP_H(T)$							T-Year Poverty Intensity, $AP_H(T)_j$						
1986	0.102	0.257	0.223	0.104	0.057	0.058	0.008	2.521	2.187	1.023	0.563	0.568	0.080
85-86	0.106	0.274	0.221	0.113	0.055	0.061	0.011	2.574	2.082	1.062	0.517	0.577	0.108
84-86	0.105	0.267	0.225	0.109	0.057	0.056	0.010	2.550	2.154	1.046	0.544	0.539	0.098
83-86	0.106	0.269	0.229	0.104	0.061	0.059	0.012	2.548	2.161	0.986	0.578	0.558	0.115
82-86	0.106	0.265	0.228	0.104	0.063	0.060	0.014	2.503	2.151	0.978	0.597	0.562	0.135
77-86	0.098	0.254	0.200	0.091	0.062	0.050	0.020	2.600	2.051	0.932	0.632	0.514	0.209
Chronic Poverty, $CP_H(T)$							Chronic Poverty Intensity, $CP_H(T)_j$						
1986	0.102	0.257	0.223	0.104	0.057	0.058	0.008	2.521	2.187	1.023	0.563	0.568	0.080
85-86	0.100	0.258	0.220	0.102	0.055	0.050	0.010	2.595	2.214	1.021	0.548	0.503	0.097
84-86	0.089	0.259	0.201	0.091	0.039	0.040	0.003	2.910	2.262	1.020	0.442	0.449	0.036
83-86	0.089	0.257	0.196	0.087	0.043	0.044	0.005	2.890	2.206	0.977	0.488	0.499	0.054
82-86	0.086	0.260	0.203	0.071	0.038	0.044	0.004	3.011	2.348	0.829	0.441	0.514	0.049
77-86	0.072	0.235	0.178	0.057	0.034	0.026	0.003	3.238	2.463	0.782	0.468	0.360	0.038
Proportion of Poverty that is Chronic													
1986	1.000	1.000	1.000	1.000	1.000	1.000	1.000						
85-86	0.936	0.944	0.996	0.901	0.992	0.816	0.848						
84-86	0.849	0.969	0.892	0.828	0.689	0.707	0.311						
83-86	0.842	0.955	0.859	0.834	0.711	0.753	0.395						
82-86	0.814	0.979	0.888	0.690	0.602	0.744	0.298						
77-86	0.742	0.924	0.891	0.623	0.549	0.519	0.136						
Sample	15088	1800	3016	3308	1568	2938	2347						
Σ weights	284729	27052	44892	59923	31594	57625	62105						
Percent	100.00	9.50	15.77	21.05	11.10	20.24	21.81						

Source: PSID, Individual-Response File, 1987. Based on individuals present in the PSID family unit in 1987.

The total includes 111 (1538, 0.54%) individuals with unknown education of head.

TABLE 6

Post-Transfer, Post-Tax Poverty and Poverty Intensity in the 1987 U.S. Population,
Decomposed by Race, Type of Household, Education of Head,
Measured over Income Periods of Different Lengths

Income Period	Total	African American					Other Races					African American					Other Races																		
		Female Headed Family					Other Household					Female Headed Family					Other Household					Female Headed Family					Other Household								
		No HS Dip		HS Dip			No HS Dip		HS Dip			No HS Dip		HS Dip			No HS Dip		HS Dip			No HS Dip		HS Dip			No HS Dip		HS Dip			No HS Dip		HS Dip	
		(1)	(2)	(3)	(4)		(5)	(6)	(7)	(8)		(9)	(10)	(11)	(12)		(13)	(14)	(15)	(16)		(17)													
A. Blackburn's Index																																			
T-Year Poverty, AP _{max} (T)									T-Year Poverty Intensity, AP _{max} (T) _i																										
1986	0.057	0.338	0.209	0.167	0.091	0.185	0.042	0.071	0.025	5.952	3.682	2.939	1.594	3.256	0.742	1.249	0.443																		
85-86	0.072	0.368	0.242	0.169	0.076	0.273	0.077	0.070	0.042	5.120	3.364	2.348	1.053	3.805	1.073	0.972	0.585																		
84-86	0.072	0.362	0.208	0.176	0.090	0.248	0.076	0.071	0.043	5.056	2.901	2.453	1.262	3.465	1.062	0.990	0.599																		
83-86	0.067	0.354	0.197	0.169	0.091	0.228	0.069	0.069	0.038	5.316	2.968	2.541	1.373	3.421	1.043	1.041	0.567																		
82-86	0.064	0.358	0.191	0.186	0.092	0.215	0.070	0.067	0.035	5.544	2.964	2.891	1.426	3.330	1.089	1.034	0.544																		
77-86	0.053	0.314	0.159	0.168	0.083	0.171	0.051	0.060	0.027	5.904	2.997	3.165	1.568	3.215	0.966	1.132	0.502																		
Chronic Poverty, CP _{max} (T)									Chronic Poverty Intensity, CP _{max} (T) _i																										
1986	0.057	0.338	0.209	0.167	0.091	0.185	0.042	0.071	0.025	5.952	3.682	2.939	1.594	3.256	0.742	1.249	0.443																		
85-86	0.042	0.315	0.197	0.130	0.050	0.174	0.025	0.047	0.016	7.551	4.727	3.103	1.199	4.162	0.611	1.114	0.373																		
84-86	0.034	0.284	0.149	0.118	0.046	0.153	0.021	0.037	0.011	8.420	4.434	3.495	1.375	4.550	0.609	1.088	0.315																		
83-86	0.030	0.277	0.132	0.110	0.043	0.144	0.020	0.035	0.007	9.327	4.447	3.710	1.448	4.836	0.671	1.168	0.229																		
82-86	0.028	0.279	0.127	0.114	0.042	0.141	0.020	0.031	0.006	9.854	4.484	4.045	1.500	4.977	0.718	1.109	0.198																		
77-86	0.021	0.239	0.095	0.101	0.027	0.088	0.011	0.025	0.002	11.615	4.627	4.887	1.322	4.289	0.557	1.200	0.119																		
Proportion of Poverty that is Chronic																																			
1986	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000																										
85-86	0.581	0.857	0.817	0.768	0.662	0.636	0.331	0.666	0.371																										
84-86	0.470	0.783	0.719	0.670	0.512	0.618	0.270	0.517	0.247																										
83-86	0.447	0.785	0.670	0.653	0.472	0.632	0.288	0.502	0.181																										
82-86	0.438	0.779	0.663	0.613	0.461	0.655	0.289	0.470	0.159																										
77-86	0.387	0.762	0.598	0.598	0.327	0.517	0.224	0.411	0.092																										
B. Foster, Greer and Thorbecke's Index																																			
T-Year Poverty, AP _{po} (T)									T-Year Poverty Intensity, AP _{po} (T) _i																										
1986	0.016	0.098	0.066	0.046	0.029	0.056	0.012	0.019	0.006	6.321	4.255	2.952	1.835	3.608	0.759	1.192	0.388																		
85-86	0.018	0.115	0.073	0.046	0.024	0.075	0.016	0.018	0.008	6.479	4.118	2.590	1.345	4.224	0.900	1.036	0.452																		
84-86	0.017	0.113	0.062	0.051	0.026	0.071	0.016	0.018	0.008	6.497	3.573	2.923	1.470	4.065	0.928	1.010	0.464																		
83-86	0.017	0.111	0.059	0.049	0.027	0.066	0.016	0.018	0.008	6.569	3.516	2.910	1.584	3.919	0.940	1.065	0.450																		
82-86	0.017	0.113	0.057	0.052	0.027	0.063	0.017	0.018	0.007	6.713	3.415	3.108	1.603	3.750	1.022	1.066	0.443																		
77-86	0.014	0.100	0.048	0.049	0.024	0.051	0.013	0.016	0.006	6.925	3.337	3.402	1.685	3.556	0.913	1.132	0.427																		
Chronic Poverty, CP _{po} (T)									Chronic Poverty Intensity, CP _{po} (T) _i																										
1986	0.016	0.098	0.066	0.046	0.029	0.056	0.012	0.019	0.006	6.321	4.255	2.952	1.835	3.608	0.759	1.192	0.388																		
85-86	0.012	0.097	0.063	0.037	0.016	0.056	0.007	0.013	0.004	7.909	5.182	3.069	1.279	4.613	0.585	1.053	0.338																		
84-86	0.010	0.089	0.044	0.033	0.015	0.049	0.006	0.010	0.003	9.075	4.516	3.340	1.553	5.045	0.635	0.991	0.291																		
83-86	0.009	0.085	0.038	0.031	0.014	0.045	0.005	0.009	0.002	9.881	4.408	3.579	1.643	5.292	0.582	1.044	0.230																		
82-86	0.008	0.086	0.037	0.032	0.014	0.044	0.005	0.008	0.002	10.551	4.521	3.939	1.690	5.369	0.589	0.970	0.198																		
77-86	0.006	0.069	0.025	0.026	0.008	0.025	0.003	0.006	0.001	12.393	4.562	4.777	1.396	4.446	0.506	1.130	0.114																		
Proportion of Poverty that is Chronic																																			
1986	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000																										
85-86	0.690	0.842	0.868	0.817	0.656	0.753	0.448	0.702	0.516																										
84-86	0.563	0.786	0.711	0.643	0.595	0.699	0.385	0.552	0.353																										
83-86	0.511	0.768	0.640	0.628	0.530	0.690	0.316	0.501	0.261																										
82-86	0.482	0.758	0.638	0.611	0.508	0.690	0.277	0.438	0.216																										
77-86	0.384	0.688	0.526	0.540	0.318	0.481	0.213	0.384	0.102																										
Sample weights	15088	1020	1177	1605	2011	316	518	1832	6408																										
Percent	284729	5682	7902	8910	12400	7539	13608	49325	176653																										
Percent	100.00	2.00	2.78	3.13	4.36	2.65	4.78	17.32	62.04																										

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TABLE 6 - continued

Post-Transfer, Post-Tax Poverty and Poverty Intensity in the 1987 U.S. Population,
Decomposed by Race, Type of Household, Education of Head,
Measured over Income Periods of Different Lengths

Income Period	Total	African American				Other Races				African American				Other Races			
		Female Headed Family		Other House-hold		Female Headed Family		Other House-hold		Female Headed Family		Other House-hold		Female Headed Family		Other House-hold	
		No HS Dip	HS Dip	No HS Dip	HS Dip	No HS Dip	HS Dip	No HS Dip	HS Dip	No HS Dip	HS Dip	No HS Dip	HS Dip	No HS Dip	HS Dip	No HS Dip	HS Dip
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)

C. Head-Count Ratio

T-Year Poverty, $AP_n(T)$

1986	0.102	0.671	0.422	0.338	0.122	0.397	0.102	0.144	0.032
85-86	0.106	0.669	0.434	0.339	0.113	0.406	0.108	0.151	0.036
84-86	0.105	0.677	0.421	0.347	0.110	0.407	0.106	0.150	0.035
83-86	0.106	0.678	0.403	0.357	0.116	0.399	0.111	0.154	0.035
82-86	0.106	0.675	0.399	0.362	0.122	0.394	0.116	0.153	0.036
77-86	0.098	0.637	0.358	0.345	0.122	0.347	0.094	0.140	0.034

T-Year Poverty Intensity, $AP_n(T)$

1986	6.571	4.132	3.308	1.195	3.885	1.001	1.415	0.314
85-86	6.289	4.082	3.191	1.062	3.819	1.015	1.423	0.342
84-86	6.466	4.020	3.314	1.047	3.885	1.012	1.434	0.331
83-86	6.416	3.812	3.378	1.096	3.775	1.054	1.461	0.333
82-86	6.371	3.767	3.412	1.152	3.718	1.095	1.445	0.338
77-86	6.517	3.665	3.529	1.254	3.552	0.966	1.436	0.352

Chronic Poverty, $CP_n(T)$

1986	0.102	0.671	0.422	0.338	0.122	0.397	0.102	0.144	0.032
85-86	0.100	0.707	0.424	0.334	0.105	0.363	0.077	0.144	0.032
84-86	0.089	0.674	0.419	0.329	0.091	0.365	0.057	0.131	0.022
83-86	0.089	0.692	0.396	0.337	0.089	0.344	0.091	0.125	0.022
82-86	0.086	0.690	0.360	0.375	0.092	0.362	0.079	0.124	0.018
77-86	0.072	0.680	0.320	0.354	0.094	0.290	0.047	0.104	0.010

Chronic Poverty Intensity, $CP_n(T)$

1986	6.571	4.132	3.308	1.195	3.885	1.001	1.415	0.314
85-86	7.105	4.260	3.357	1.058	3.641	0.772	1.442	0.318
84-86	7.584	4.719	3.697	1.027	4.104	0.636	1.473	0.251
83-86	7.772	4.454	3.785	0.996	3.868	1.024	1.410	0.251
82-86	8.003	4.172	4.347	1.062	4.196	0.915	1.437	0.213
77-86	9.376	4.419	4.889	1.292	4.001	0.646	1.439	0.141

Proportion of Poverty that is Chronic**

1986	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
85-86	0.936	1.058	0.977	0.985	0.933	0.893	0.712	0.949	0.870
84-86	0.849	0.996	0.997	0.947	0.833	0.897	0.533	0.872	0.643
83-86	0.842	1.020	0.983	0.943	0.765	0.863	0.817	0.812	0.636
82-86	0.814	1.022	0.901	1.037	0.750	0.918	0.680	0.810	0.513
77-86	0.742	1.067	0.895	1.028	0.765	0.836	0.496	0.744	0.297
Sample	15088	1020	1177	1605	2011	316	518	1832	6408
weights	284729	5682	7902	8910	12400	7539	13608	49325	176653
Percent	100.00	2.00	2.78	3.13	4.36	2.65	4.78	17.32	62.04

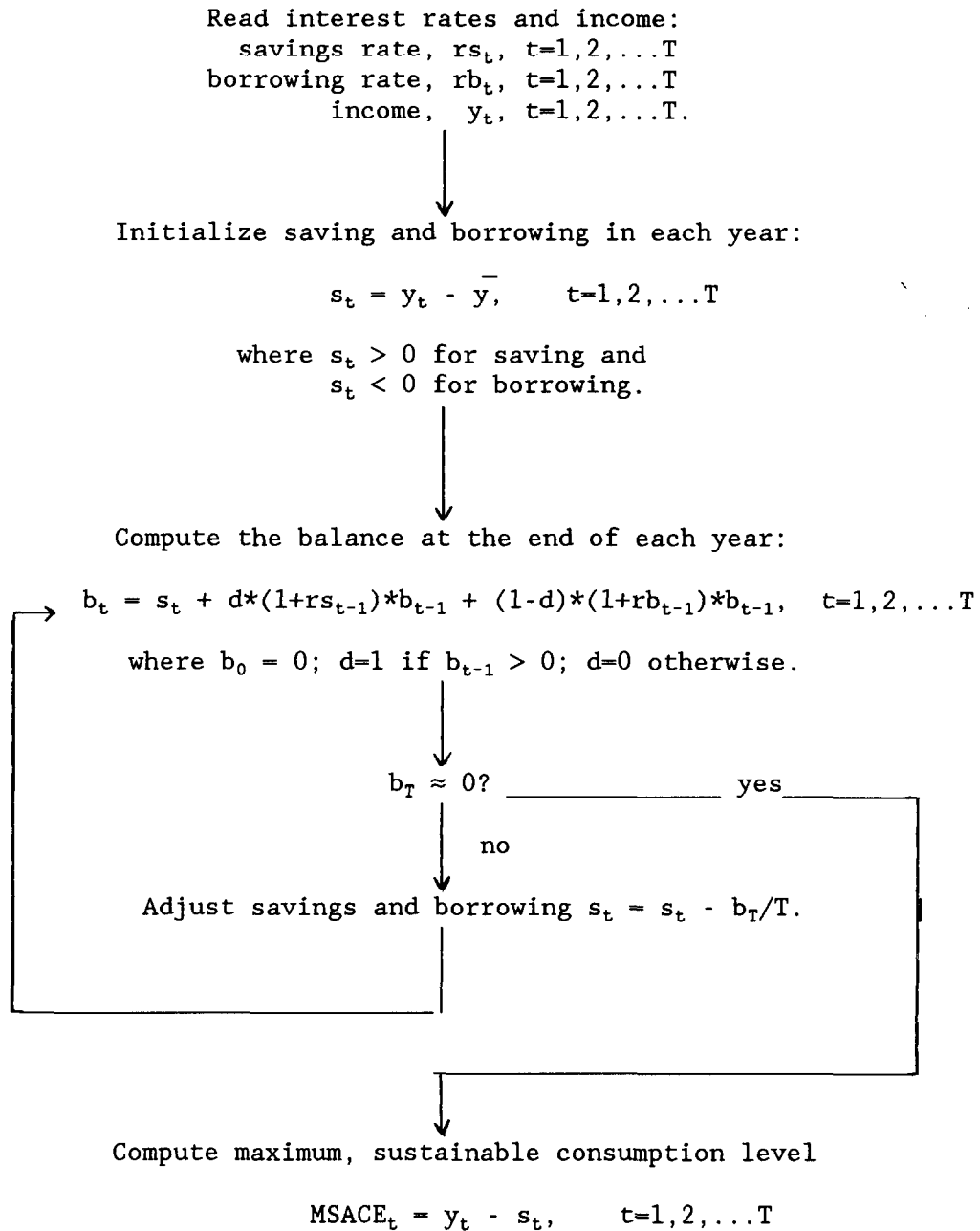
Source: PSID, Individual-Response File, 1987. Based on individuals present in the PSID family unit in 1987.

The total includes 201 (weights = 2710, 0.95%) individuals with unknown race, household type or education.

** Since the head-count ratio violates the transfer axiom the proportion of poverty which is chronic can exceed one. This demonstrates an undesirable feature of the head-count ratio.

FIGURE 1

Algorithm to Determine the Maximum Sustainable Level of Consumption



APPENDIX A

Definition of Household Income

Household income is comprised of three basic components:

1. Total household money income (PSID variable V14670), which has a range of \$1 to \$999,999.
2. The value of food stamps received by the household unit (PSID variable V13880), which has a range of \$0 to \$9,999 in all years except 1967 and 1972. In 1967 the range is \$0 to \$999 and no data are available in 1972.
3. Lump sum payments received by the household unit (PSID variable V14502), which has a range of \$0 to \$999,998 for the years 1983 through 1986. A value of 999999 in these years indicates that data are either not available or not known; these values were set to zero. For 1982 and earlier years the variable was categorical. The categories and the values used as representative of them are as follows:

category 0.	\$0	represented by	\$0
category 1.	\$1-500	represented by	\$250
category 2.	\$500-999	represented by	\$750
category 3.	\$1000-1999	represented by	\$1500
category 4.	\$2000-2999	represented by	\$2500
category 5.	\$3000-4999	represented by	\$4000
category 6.	\$5000-7499	represented by	\$6250
category 7.	\$7500-9999	represented by	\$8750
category 8.	> \$10000	represented by	\$10000
category 9.	n.a.	represented by	\$0

Component 1, household money income, is in turn comprised of the following elements:

A. Taxable Income of Head and Wife/"Wife" (V13920)

Head's labor part of farm income (V13896)
Head's labor part of unincorporated business income (V13897)
Head's income from wages and salaries in 1986 (V13898)
Head's income from bonuses, overtime and/or commissions (V13900)
Head's income from professional practice or trade (V13901)
Head's labor portion of income from farming or market gardening (V13902)
Head's labor portion of income from roomers and boarders (V13903)
Wife/"Wife's" wages and other labor income (V13905)
Head's and wife/"wife's" asset portion of farm income (V13907)
Head's and wife/"wife's" asset portion of unincorp business income (V13908)
Head's and wife/"wife's" asset portion of farming or market gardening (V13909)
Head's and wife/"wife's" asset portion of income from roomers & boarders (V13910)
Head's income from rent (V13913)
Head's income from dividends, interest, trust funds and royalties (V13915)
Head's alimony received (V13917)
Wife/"Wife's" other income from assets (incl rent, dividends, interest etc) (V13918)

B. Total Transfers of Head and Wife/"Wife" (V13970)

Amount of ADC/AFDC received by head (V13928)
Amount of supplement security income received by head (V13931)
Amount of other welfare payments received by head (V13932)
Amount of social security payments received by head (V13934)
Amount of veterans administration pension payments received by head (V13937)
Amount of other retirement, pensions and annuities received by head (V13939)
Amount of unemployment pay and strike benefits received by head (V13941)
Amount of worker's compensation received by head (V13942)
Amount of child support received by head (V13944)
Amount of help from relatives received by head (V13946)
Amount of other transfer income received by head (V13948)
Amount of ADC/AFDC received by wife/"wife" (V13949)
Amount of supplement security income received by wife/"wife" (V13952)
Amount of other welfare payments received by wife/"wife" (V13953)
Amount of social security payments received by wife/"wife" (V13955)
Amount of veterans administration pension payments received by wife/"wife"
(V13958)
Amount of other retirement, pensions and annuities received by wife/"wife"
(V13960)
Amount of unemployment pay and strike benefits received by wife/"wife" (V13961)
Amount of worker's compensation received by wife/"wife" (V13962)
Amount of child support received by wife/"wife" (V13964)
Amount of help from relatives received by wife/"wife" (V13966)
Amount of other transfer income received by wife/"wife" (V13968)

C. Taxable Prorated Income of Others (V14070)

Taxable income of 1st other FU member (V14046)
Taxable income of 2nd other FU member (V14051)
Taxable income of 3rd other FU member (V14056)
Taxable income of 4th other FU member (V14061)
Taxable income of 5th other FU member (V14066)

D. Total Prorated Transfers of Others (V14086)

Amount of ADC/AFDC received by others (V14074)
Amount of supplement security income received by others (V14075)
Amount of other welfare payments received by others (V14076)
Amount of social security payments received by others (V14077)
Amount of veterans administration pension payments received by others (V14078)
Amount of other retirement, pensions and annuities received by others (V14079)
Amount of unemployment compensation received by others (V14080)
Amount of worker's compensation received by others (V14081)
Amount of child support received by others (V14082)
Amount of help from relatives received by others (V14083)
Amount of other transfer income received by others (V14084)