

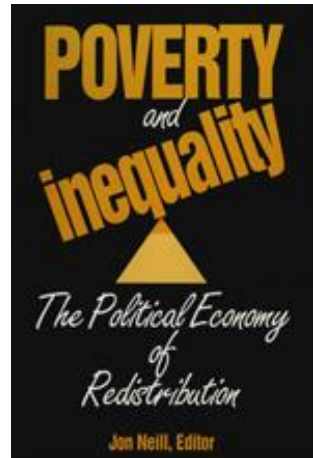
---

Upjohn Institute Press

---

# Regional Poverty and Inequality in the United States

John P. Formby  
*University of Alabama*



Chapter 4 (pp. 43-78) in:

**Poverty and Inequality: The Political Economy of Redistribution**

Jon Neill, ed.

Kalamazoo, MI: W.E. Upjohn Institute for Employment Research, 1997

DOI: 10.17848/9780585314402.ch4

# Regional Poverty and Inequality in the United States

John P. Formby  
*University of Alabama*

Poverty and income inequality are related, but distinct, aspects of the size distribution of income within a society. At the outset, it is important to understand the difference and relationship between these concepts. Poverty and inequality can be explained and illustrated by using a simple ordered income distribution. Before doing this, however, it is helpful to provide some basic intuition concerning poverty and inequality that corresponds to widely held views of disparities in income and wealth. The conversation supposedly took place between F. Scott Fitzgerald and Ernest Hemingway concerning the differences in the behavior of ordinary Americans and the wealthy. Fitzgerald is reported to have said, “You know Ernest, rich people are different from us.” Hemingway replied, “You’re right, rich people have more money than we do.” From the perspective of the economist, Hemingway was correct. It is income and wealth that matter, and they are at the essence of both poverty and inequality. The fact that some people have larger shares of the income and wealth of a society and others have smaller shares gives rise to the basic notion of economic inequality. The individuals and families with the smallest shares may be, but are not necessarily, poor. Poverty arises when the levels of income and wealth are so low that the individuals are unable to acquire the market basket of goods that are deemed essential for a minimally decent standard of living.

## **Some Basic Concepts of Poverty and Inequality**

The basic ideas underlying poverty and inequality, which are advanced in a very informal manner above, suggest that income inequality is a *relative income* concept, whereas poverty is an *absolute*

*income* concept. While these are not the only approaches to defining and measuring poverty and inequality, they are the most widely used, especially in the United States. In fact, an absolute income definition is officially incorporated into the statutory definition of poverty in the United States, whereas relative income inequality is the dominant perspective adopted by both policy makers and academic researchers around the world. The difference between relative income and absolute income and between inequality and poverty can be made clear with a simple income distribution. An income distribution is merely a list of incomes, or more formally a vector of incomes, of a group of individuals, families, or households. To illustrate the key concepts, two population groups that reside in region N and S are considered. To keep things simple, it is assumed that there are only five individuals in each region. The incomes are ordered from lowest to highest and shown in column 2 of tables 1a and 1b. The information in columns 1 and 2 shows the ordered absolute income distributions, which are plotted and shown in figure 1a. Now suppose that in both regions an income of \$16 is required to purchase the market basket of goods that are deemed to be essential for a decent, but minimum, standard of living. The income of \$16 is the *poverty threshold* and is represented by the poverty line in figure 1a. Given a poverty line of \$16, one individual, A, in region N has an absolute income below the poverty threshold and is therefore classified as poor, while two persons, F and G, in region S are below the poverty line.

The relative incomes of individual persons residing in region N and region S are given by their respective proportionate shares of total regional income and are shown in column 4 of tables 1a and 1b. The relative shares (proportions) of persons and incomes are cumulated in columns 5 and 6. The cumulative shares of persons and incomes can be used to construct Lorenz curves, which provide the most basic way of representing economic inequality in a society or region. The relative income distributions in regions N and S are depicted by the Lorenz curves shown in figure 1b, which are obtained by plotting the cumulative shares of persons and incomes in columns 5 and 6. Relative inequality in a region is shown by the deviations of the Lorenz curves away from the 45° degree line in figure 1b, which represents complete equality in the distribution of income.

**Table 1. Two Simple Income Distributions—Regions N and S**

<b>1a. Region N</b>					
	<b>Shares (proportions)</b>			<b>Cumulative shares</b>	
	<b>Person (1)</b>	<b>Incomes \$<sup>a</sup> (2)</b>	<b>Persons (3)</b>	<b>Income (4)</b>	<b>Persons (5)</b>
A	12	.20	.0923	.20	.0923
B	18	.20	.1385	.40	.2308
C	22	.20	.1692	.60	.4000
D	28	.20	.2154	.80	.6154
E	50	.20	.3846	1.00	1.0000
	\$130	1.00	1.00		

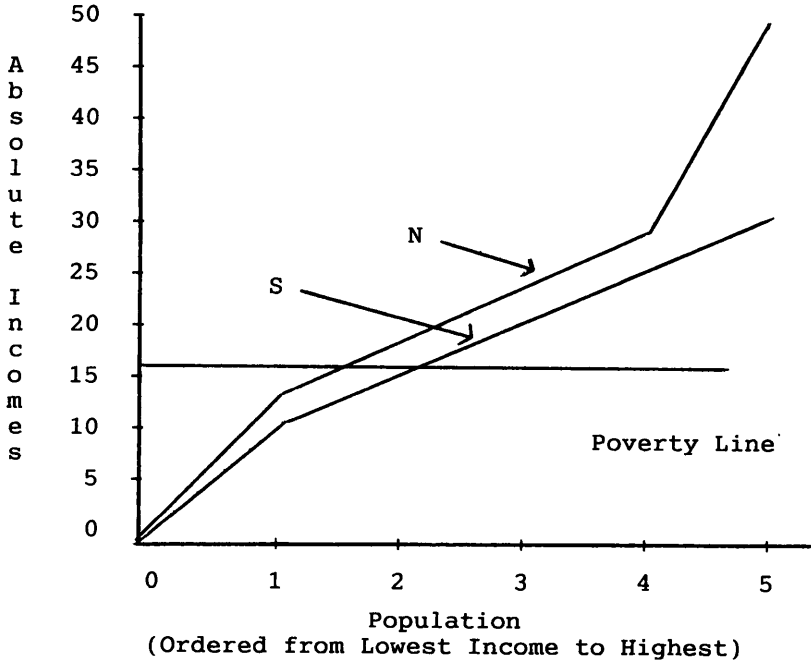
  

<b>1b. Region S</b>					
	<b>Shares (proportions)</b>			<b>Cumulative shares</b>	
	<b>Person (1)</b>	<b>Incomes \$<sup>a</sup> (2)</b>	<b>Persons (3)</b>	<b>Income (4)</b>	<b>Persons (5)</b>
F	10	.20	.10	.20	.10
G	15	.20	.15	.40	.25
H	20	.20	.20	.60	.45
I	25	.20	.25	.80	.70
J	30	.20	.30	1.00	1.00
	\$100	1.00	1.00		

a. Incomes are ordered from lowest to highest

Figure 1b tells the entire story about income inequality in regions N and S, but it deserves emphasis that the relative income distributions tell us nothing about regional poverty. The Lorenz curves in figure 1b are consistent with the existence of extreme poverty or with the total absence of poverty in regions N and S. Similarly, figure 1a conveys much about poverty in regions N and S, but little about income inequality. In summary, if we wish to know about economic inequality, we must focus on relative incomes, and the most basic method for doing this is to look directly at the Lorenz curves, which show the distribution of relative incomes. If the goal is to learn about poverty, the task is

**Figure 1a. Absolute Incomes and the Poverty Line in Two Regions**

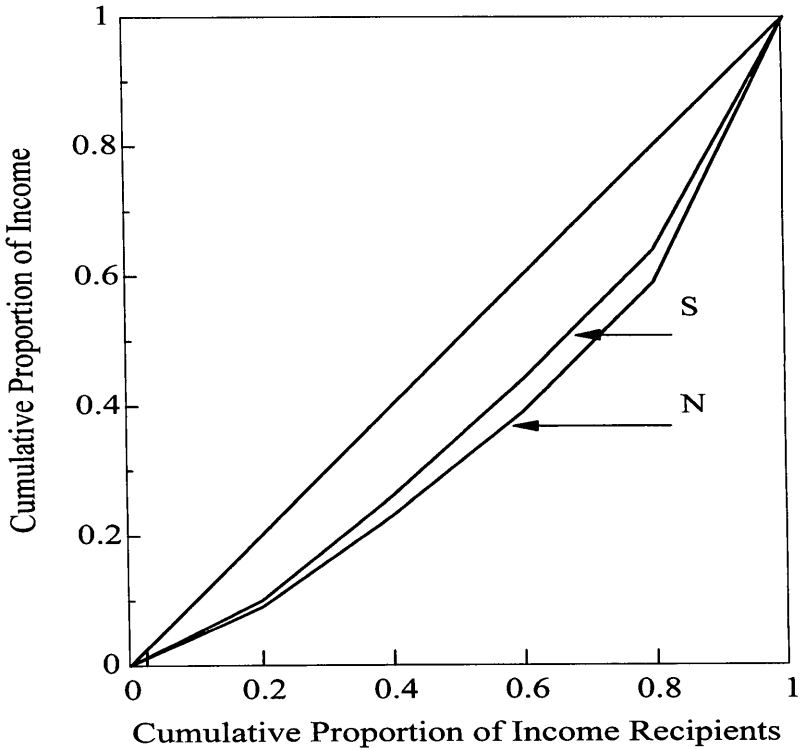


somewhat more complex. However, the basic starting point is with the absolute income distributions and the poverty line, which are depicted in figure 1a.

**Widely Used Measures of Poverty and Inequality**

Poverty and inequality can be measured in a variety of different ways, but all build upon the absolute and relative income concepts described above. It is useful to briefly identify and describe several of the most widely used measures that will be utilized in reporting on regional poverty and inequality below. The United States is one of the few countries that has an official definition of poverty, widely referred to as the *headcount ratio* measure of poverty or, more simply, the pov-

Figure 1b. Lorenz Curves for Two Regions



erty rate. You begin with the poverty line and count the number of persons with incomes below the poverty threshold; the headcount ratio (poverty rate) is simply the proportion of the population with incomes below the poverty line. For example, in our simple income distributions, for a \$16 poverty line, the headcount ratio measure of poverty in region N is .2, which means one out of five persons is poor. In region S, the poverty rate is .4, which means that 40 percent of the population (two out of five) is poor.

Several difficulties with the headcount measure of poverty will be discussed below, but for now it is sufficient to note that it is an intuitively appealing and easily understood concept that captures an important dimension of poverty. However, for the reasons explained in the

next section, the official headcount measure of poverty fails to incorporate all relevant aspects of poverty, and it is essential that it be supplemented with better measures of income and additional dimensions of poverty that encapsulate the missing information.

It is apparent from figure 1a that the extent of poverty in a region depends upon where the poverty line is drawn. If the line is drawn at \$8 rather than \$16, there are no poor people in either region! Alternatively, if the poverty line is \$23, the poverty rate stands at .6 in both regions. Thus, two important issues in poverty measurement are: how should the poverty line be determined, and exactly where should it be drawn? This issue is returned to below, but as a starting point it is helpful to explain how the official U.S. poverty line was originally determined, and how it is redrawn each year. The poverty threshold levels of income were developed in the early 1960s by Mollie Orshansky and her colleagues in the Social Security Administration. Using detailed consumption expenditure data from the 1950s, it was estimated that, on average, U.S. families spent approximately one-third of their cash income on food. Orshansky (1965) used these food expenditures to estimate what it would cost in 1964 to purchase the U.S. Department of Agriculture's Economy Food Market Basket, which contained the requisite nutrients for "temporary or emergency use when funds are low." These costs were then multiplied by three to obtain the poverty threshold level of income. The expenditure studies revealed that spending on food varied with the size of the family and with the age of the family head. Families with an elderly head were determined to spend significantly less on food than other families, and larger families were found to spend more than smaller families. As a consequence, the poverty threshold incomes were different depending upon the size of the family and whether the head was aged 65 or older. In 1969 the Orshansky income thresholds were officially adopted by the federal government for purposes of measuring poverty. To change the official poverty line across time, the Orshansky thresholds are deflated by using the consumer price index. Table 2 shows the poverty thresholds for 1992 for different sized families and for nonelderly heads.

Like poverty, income inequality can be measured in a variety of ways. A method that yields unanimous agreement concerning inequality comparisons is referred to as Lorenz dominance (Atkinson 1970). In figure 1b the Lorenz curve of region S is closer to the line of com-

**Table 2. U.S. Poverty Thresholds in 1992 by Family Size, Number of Children and Age of Household Head**

Family size	Poverty Thresholds (\$) by Number of Children								
	None	One	Two	Three	Four	Five	Six	Seven	Eight+
One person									
Under 65	7,299								
65 or over	6,729								
Two Persons									
HH under 65	9,395	9,670							
HH 65 or over	8,480	9,634							
Three persons	10,974	11,293	11,304						
Four persons	14,471	14,708	14,228	14,277					
Five persons	17,451	17,705	17,163	16,743	16,487				
Six persons	20,072	20,152	19,737	19,339	18,747	18,396			
Seven persons	23,096	23,240	22,743	21,751	20,998	20,171			
Eight persons	25,831	26,059	25,590	25,179	24,596	23,855	23,085	22,889	
Nine+ persons	31,073	31,223	30,808	30,459	29,887	29,099	28,387	28,211	27,124

SOURCE. U S Bureau of the Census (1993)

NOTE HH denotes household head



plete equality than the Lorenz curve of region N. S is said to Lorenz dominate N, which means that regardless of the specific numerical measure (index) used, inequality will always be less in S than in N. A corollary to Atkinson's Lorenz dominance theorem is that if the Lorenz curves of interest intersect, two summary indices of inequality can always be found that yield a conflicting ranking of inequality; one index will rank region S as more equal, whereas the second index will rank region N as more equal. In our example, Lorenz dominance prevails, and there is no need to worry about the problem of conflicting index numbers. Therefore, any number of inequality indices can be chosen to represent the level of inequality.

The Gini index is the most widely used and discussed measure of inequality, and its intuitive meaning can be easily conveyed using the Lorenz curves in figure 1b. The Gini index varies between 0 and 1.0, with zero indicating complete equality and 1.0 representing the most extreme inequality imaginable (complete inequality). The Gini index is larger the more the Lorenz curve bows away from the 45° line, which represents a perfectly equal income distribution. Thus, one can look at figure 1b and see immediately that region N has a larger Gini index than region S because at every point its Lorenz curve is further away from the line of equality. The Gini index has a simple geometric interpretation that is related to the line of equality; the Gini is always equal to twice the area between the 45° line (perfect equality) in figure 1b and the Lorenz curve of interest. In our example involving regions S and N, taking the necessary integrals and doing the calculations reveals that  $G_N = 0.276$  and  $G_S = 0.207$ . Thus, according to the Gini measure of inequality, income inequality is *one-third* greater in region N than region S. Like the headcount poverty measure, the Gini index is not a perfect measure. For this reason the Lorenz dominance is the primary method relied upon in discussing income inequality below. However, because it is easy to interpret and widely used, Gini indices of inequality are also presented. The Gini index is also used when we incorporate the distribution of income among the poor into an expanded and improved measure of poverty.

## **Headcount Measures of Poverty and Dominance Measures of Inequality**

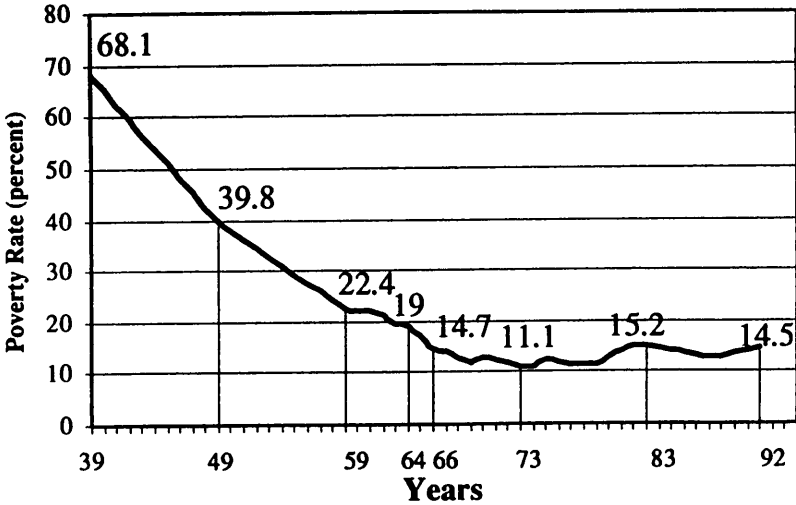
This section reviews the broad picture of regional poverty and inequality that emerges when one considers the official U.S. poverty statistics and naively applies the Lorenz dominance technique to gauge regional differences in income inequality. The historical relation between the absolute and relative income in the South compared to the rest of the United States is also briefly discussed. Measurement issues and more complex empirical estimates are considered in the sections that follow.

### *Official Poverty Statistics and Comparable Estimates for 1939 and 1949*

Official poverty statistics are available for each year beginning in 1959, and Smolensky, Danziger and Gottschalk (1988) have extended the series backward by providing comparable estimates for 1939 and 1949.<sup>1</sup> The pattern of overall headcount measures of poverty is shown in figure 2. Poverty in America fell dramatically in the 1940s, 1950s, and 1960s, reaching an historical low point in 1973. Beginning in the mid-1970s, the trend in headcount poverty has been mildly upward, with cyclical swings and peaks occurring shortly after the trough of recessions. The double dip recessions in the early 1980s were particularly severe, and the headcount poverty rate reached 15.2 percent in 1983, the highest level in the last quarter century.

In 1992 the official poverty rate was 14.5 percent, which was approximately the same level as in 1966, when the War on Poverty was at its most intense level. However, the U.S. population in 1992 was 255 million, compared to 196 million in 1966. Therefore, while the headcount poverty rate is approximately the same in these two years, there were 8.5 million more Americans living in poverty in 1992 than 1966.

**Figure 2. Headcount Poverty Rates Using the Official U.S. Poverty Line and Measurement Procedures, 1939-1992**



SOURCE: For the official poverty measures for 1959-1992, the data are from U.S. Bureau of the Census (1993). The estimates for 1939 and 1949 are from Smolensky, Danziger, and Gottschalk (1988).

Table 3 shows the headcount poverty rates among major U.S. regions for selected years beginning with 1959, which is the earliest date for which official poverty statistics are available. Three implications are suggested by table 3. First, when viewed in terms of the official headcount measures, the South regularly has more poverty than other regions. This is most apparent in 1959, but continues to be true even in the most recent data. The South's poverty rate was twice the level of the rest of the country in 1959, and approximately one-half of all persons living in poverty resided in a region that accounted for only 30 percent of the U.S. population. Second, the official statistics suggest that poverty is generally lower in the Northeast than other regions. Finally, in each region and the United States as a whole, the incidence of poverty among children is approximately 150 percent of the overall poverty rate for comparable population.<sup>2</sup>

**Table 3. Regional Poverty Rates Using the Official Poverty Line and Measurement Procedures, 1959-1992**

	Northeast	Midwest	West	South	U.S.
1992	12.3 (19.7)	12.9 (19.4)	14.3 (21.3)	16.3 (24.6)	14.5 (21.7)
1989	10.0	11.9	12.5	15.4	12.8
1979	10.4	9.7	10.0	15.0	11.7
1969	8.6	9.6	10.4	17.9	12.1
1959	16.0 <sup>a</sup>			35.4	22.4

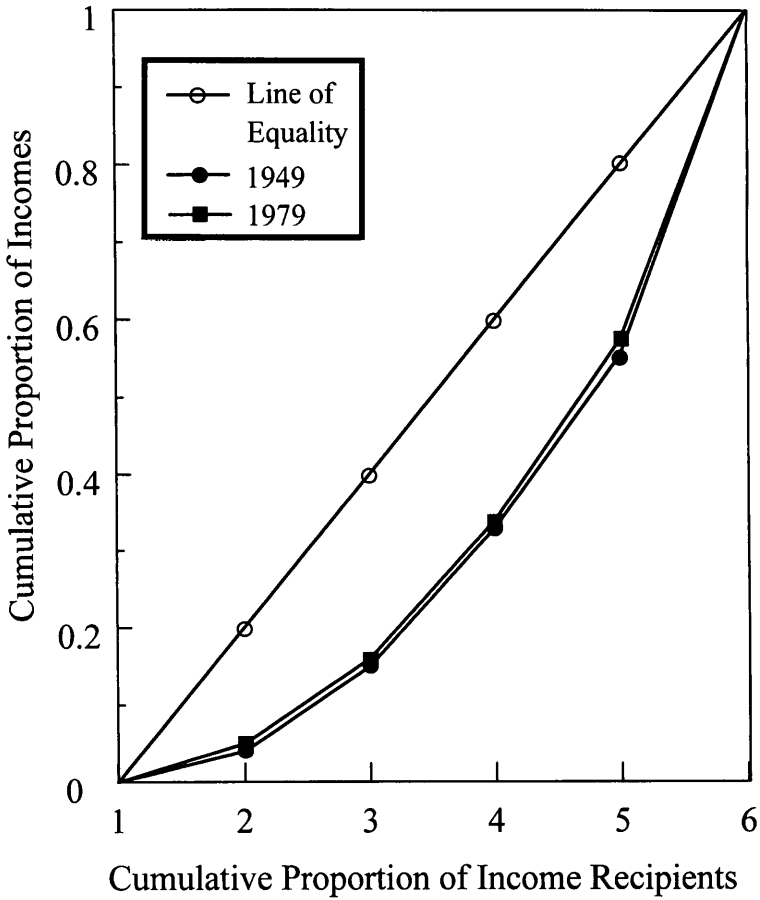
SOURCE: The official poverty statistics for 1992 are from U S Bureau of the Census (1993). For 1959-1979 the statistics are from U S Bureau of the Census (1981). The data for 1989 are from U S Bureau of the Census (1990)

NOTE Figures in parenthesis denote the poverty rates for children in major regions.

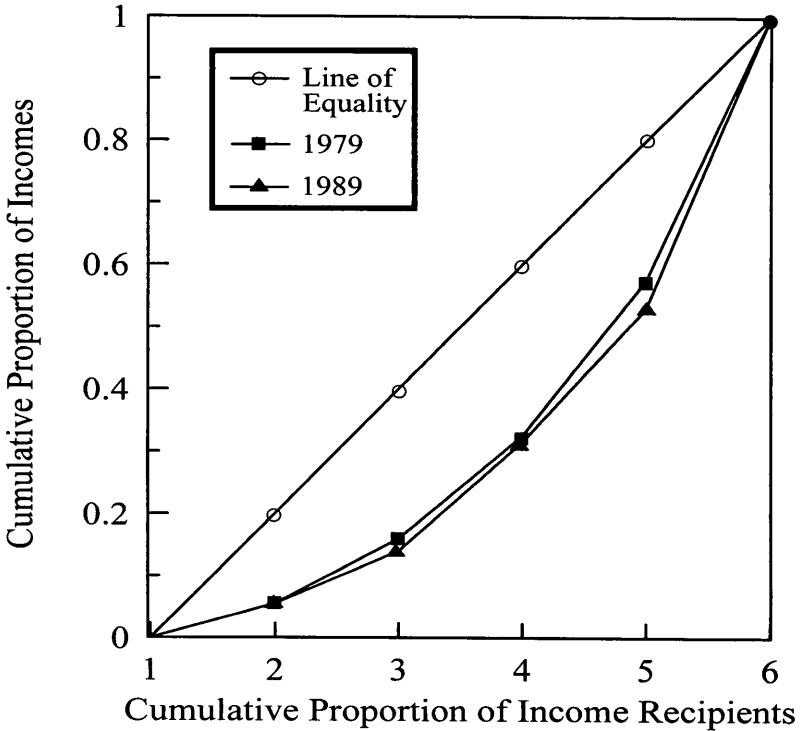
a. Applies to the non-South, i.e., the Northeast, Midwest, and West combined

### *Income Inequality*

Unlike poverty statistics, there are neither official U.S. government income distribution statistics nor official measures of economic inequality. However, there are a number of periodic surveys of large samples of American households that provide information that can be used to measure income inequality. A large sample is required to reliably gauge regional income inequality, and the two sources most often used in the U.S. are the Annual Demographic File of the Current Population Survey (March CPS survey) and the economic surveys conducted as a part of the decennial Census of Population.<sup>3</sup> We use both sources of information in our measures of regional and overall U.S. inequality. Income distribution statistics that are consistent across time are available beginning in the late 1940s. Figures 3a and 3b show Lorenz curves from the decennial Census of Population for the family income distribution in 1949, 1979, and 1989. Figure 3a shows that the 1979 Lorenz curve dominates the 1949 curve, which means that income inequality declined over this extended period. Figure 3b depicts the much discussed rise in U.S. income inequality in the 1980s and shows that 1979 Lorenz dominates 1989.<sup>4</sup>

**Figure 3a. Lorenz Curves for the United States, 1949 and 1979**

The substantial rise in income inequality in the nation as a whole in the 1980s was accompanied by increases in inequality in each of the major regions. The pattern of regional inequality suggested by the family income distributions drawn from the decennial Census of Population in 1989 is shown in table 4 and figure 4. Pairwise comparisons of the Lorenz ordinates in table 4 reveal that in 1989 the Midwest Lorenz curve dominates each of the other major regions, while the South is

**Figure 3b. Lorenz Curves for the United States, 1979 and 1989**

Lorenz-dominated by all regions. Note that in columns 2 and 5 of table 4 the Gini coefficient for the Northeast is slightly smaller than in the West, which suggests more equality. However, inspection of the Lorenz ordinates reveals that the Lorenz curves in these two regions intersect. Under these conditions it is always possible to find at least two inequality indices that yield contradictory ranking of regional inequality. This needs to be recognized in interpreting the Gini coefficients for the Northeast and West. Figure 4 shows Hesse diagrams of the inequality orderings of the regions in 1989. The Lorenz ranking of the Northeast and West appear on the same level, which means that they cannot be ranked using the Lorenz dominance criterion.

**Table 4. Regional and Overall U.S. Income Inequality in 1980**

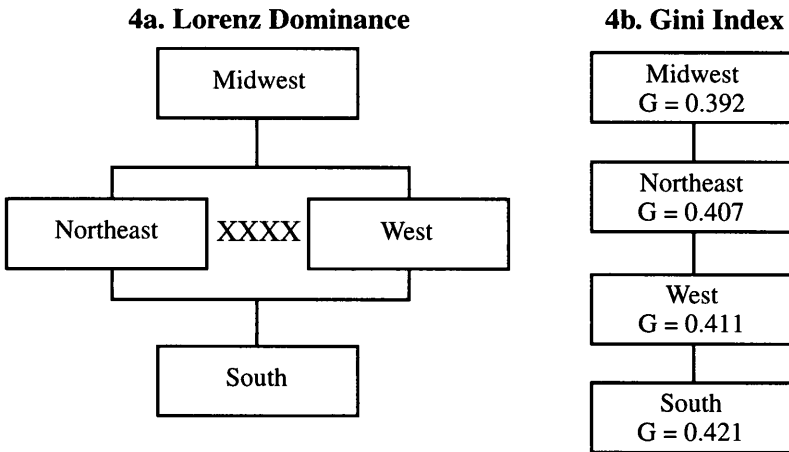
Cumulative Proportion of Families (1)	Cumulative Proportion of Incomes				
	Northeast (2)	Midwest (3)	South (4)	West (5)	U.S. (6)
.10	0.013	0.014	0.012	0.014	0.013
.20	0.044	0.048	0.041	0.045	0.044
.30	0.091	0.096	0.085	0.009	0.089
.40	0.151	0.157	0.042	0.149	0.147
.50	0.224	0.233	0.263	0.221	0.22
.60	0.312	0.324	0.301	0.309	0.309
.70	0.413	0.429	0.406	0.411	0.412
.80	0.539	0.552	0.53	0.538	0.535
.90	0.704	0.714	0.695	0.703	0.702
1.00	1.000	1.000	1.000	1.000	1.000
<b>Gini Index</b>	0.407	0.392	0.421	0.410	0.411

SOURCE Calculated from summary income distribution data from the 1990 U S Census Population Estimates are made using a cubic spline procedure Pareto's Law is used to estimate the mean of the open-ended income class

### *The South's Income Distribution in Historical Perspective*

The official poverty statistics and the income distribution statistics from the last five Census of Populations indicate two important pieces of information concerning regional income distributions. The South appears to have lower absolute incomes at the bottom of the income distribution, hence greater headcount poverty and more relative income inequality than the rest of the country. These results are consistent with indirect historical evidence presented by Williamson (1977), which strongly suggests that the South had a lower average family income and greater income inequality throughout the period 1820 to 1930. Thus, the patterns that are observed in reviewing official poverty statistics and Census income distribution data seem to represent a continuation of the historical pattern of the 19th century. However, Wright

**Figure 4. Lorenz and Gini Rankings of Regional Family Income Distributions\***



\*Estimated from summary income distribution statistics using a cubic spline procedure

(1987) has emphasized that fundamental changes in the 1940s, 1950s, and 1960s resulted in the emergence of a national labor market, which diminished regional differences in the American labor force. This in turn has immense implications for regional income distributions. These changes are discussed further below.

### **Measurement Issues in Evaluating Regional Poverty and Income Inequality**

There are a number of difficulties in the measurement of income distributions that affect the reliability of poverty and inequality measures. Only the major issues most relevant to evaluating regional poverty and inequality in the United States are discussed. In brief, the chief problems associated with measuring poverty are as follows:



1. The official poverty statistics are based upon "Census money income," which excludes noncash transfers such as food stamps and the subsidized component in public housing as well as taxes.<sup>5</sup>
2. The official poverty line is essentially arbitrary and could be drawn at higher or lower income thresholds. In practice, the only change in the official poverty line across time involves inflating the Orshansky income thresholds to correct for changes in the Consumer Price Index.
3. The Orshansky food expenditure-based income thresholds involve a specific equivalent scale for households, and it is now widely recognized that there are a large number of such equivalent scales that could be used to construct alternative measures of poverty.
4. The official poverty line fails to take into account regional and urban-rural variations in the cost of living, which results in an overstatement of poverty in regions with low living costs and an understatement in high-cost regions.
5. Headcount poverty fails to measure the intensity or severity of poverty; a person whose income is far below the poverty line is treated as if he or she is equivalent to a person who is barely below poverty. Similarly, a person who is permanently poor (due, say, to a disability that results in zero or low earnings) is treated as equivalent to a person who is temporarily down and out, but who will soon recover and exit from the poverty group.
6. Given a particular poverty line, the official poverty statistics fail to consider the distribution of income among the low-income population.
7. The official poverty statistics are based upon the March CPS survey and are subject to well-known sampling error problems.

There are also measurement issues that are encountered in assessing income inequality. Fortunately, they are not nearly so severe as in the case of poverty. As noted above, there is no official government measure of inequality, nor is there anything comparable to a poverty line in inequality measurement. Moreover, inequality is a relative income concept, and there is generally no need to make adjustments for regional differences in the cost of living. Further, there is wide agreement that

Lorenz dominance is the most general method of gauging inequality, and the measurement procedures are straightforward. Nevertheless, there are a number of problems worth noting.

First, a fundamental measurement problem arises when Lorenz curves intersect. Under these conditions inequality indices can yield contradictory results. An approach that has evolved in the empirical study of inequality is to calculate a number of popular inequality indices to determine whether they in fact conflict.<sup>6</sup> This approach misses the point and is really not satisfactory; when Lorenz curves cross perfectly, defensible inequality indices can always be uncovered that yield conflicting rankings. Fortunately, there has been some recent progress on this issue and a better procedure based upon dominance principles is now available and can be applied when Lorenz curves intersect.<sup>7</sup>

A second problem in assessing inequality is identical to one encountered in evaluating poverty; income distribution statistics are invariably based upon surveys and are subject to sampling error. The wide availability of micro data that can be used in measuring inequality has led to the development of statistical inference procedures that take sampling errors into account. These procedures also allow researchers to test scientific hypotheses concerning both regional poverty and inequality. Thus, progress has been made on this measurement problem as well. However, the availability and wide use of micro data raises additional measurement questions that must be addressed if differences and changes in regional inequality are to be properly addressed. These include the following:

1. When micro data are used, the researcher can define the income-receiving unit in several different ways, and it is well known that the choice of the recipient unit can influence the resulting measures of relative inequality. Alternative definitions of the recipient include families, households, persons, spending units, and the equivalent number of adults in a household, family, or spending unit.
2. If the equivalent number of adults is used as the recipient unit, which of the many adult equivalence scales should be used? The choice of the scale may affect the outcome.

3. What accounting period should be used in measuring income inequality? Typically one year is used, but this is arbitrary. Most (but not all) micro data sets including the widely used March CPS survey allow for longer periods, and some surveys allow for shorter periods. Typically, the researcher has a range of options concerning the time period over which income is measured, and the choice can influence measured inequality.<sup>8</sup>

### **Expanded Measures of Regional Poverty and Inequality**

This section provides expanded and improved measures of regional poverty and income inequality that rely upon micro data and correct for some (but not all) of the measurement difficulties outlined above. We begin by discussing Amartya Sen's distribution-sensitive index of poverty and then report on recent research by Bishop, Formby and Zheng (1994) that presents new evidence on regional poverty based upon the Census money income used in making official poverty estimates and a more comprehensive income measure that includes the effects of direct taxes and noncash transfers. These expanded estimates correct for the problem of sampling error and consider the implications of alternative poverty lines. The section concludes with a discussion of expanded measures of regional income inequality that are provided by Bishop, Formby and Thistle (1992, 1994).

#### *Sen Measures of Regional Poverty*

Sen (1976) argues persuasively that poverty should be measured and evaluated using a three-prong approach that considers the headcount of a population living below the poverty line, the income shortfalls of the poor, and the inequality of incomes among the poor. According to Sen, neither headcount nor income gap measures of poverty, either taken together or used alone, are adequate measures of poverty. In Sen's view, an acceptable measure of poverty must be *distribution-sensitive*, which means that a transfer of income among the low-income population must be reflected in the overall measure of poverty index. In particular, if income is redistributed from an extremely poor person to a higher income person below the poverty line, the measure of poverty

should increase, not decrease. To better understand this point, again consider the simple income distribution in regions N and S, shown in table 1. If the poverty threshold is \$22 then three persons in each region are classified as poor according to the headcount measure of poverty. Now suppose the government's Antipoverty Agency declares a War on Poverty and uses its powers to redistribute \$3 from the poorest person in each region, A and F, to the least poor person, C and H. The transfers raise the incomes of C and H so that these individuals are moved above the poverty line. Thus, headcount poverty falls in both regions and the poverty fighting agency can claim success. However, the redistribution from an intensely poor person to a less poor person always increases relative inequality among the poor. One of Sen's great accomplishments demonstrates that when the headcount ratio and average income shortfall (poverty gap) of the poor are both constant, a rise in income inequality among the poor necessarily increases the economic deprivation among the poor. This is the case irrespective of whether the rise in income inequality among the poor is caused by market forces or a change in government policies.

To avoid these difficulties Sen proposes a poverty index that is simultaneously sensitive to headcount poverty, the income shortfall of the poor (poverty gap), and the distribution of income among the poor. His index is said to be a "distribution-sensitive measure of poverty" and is now widely referred to simply as the Sen index. To incorporate all relevant dimensions of poverty, Sen proposes an index that is equal to the aggregated income gaps between each poor person's income and the poverty line, weighted by each individual's relative rank among the poor. Sen shows that such an index, which is denoted as  $S$ , can be written as:

$$S = H \left[ I + (1 - I) G_p \frac{q}{q + 1} \right]$$

where  $H$  is the headcount poverty ratio,  $I$  is the ratio of the average income shortfall-to-poverty line (hereinafter referred to as the poverty gap ratio),  $G_p$  is the Gini coefficient of income inequality among the poor, and  $q$  is the number of people below the poverty threshold.

Bishop, Formby and Zheng (1994) use the Sen index and its components—the headcount poverty ratio ( $H$ ), the poverty gap ratio ( $I$ ), and the Gini coefficient of income inequality among the poor ( $G_p$ )—to pro-

vide expanded measures of regional poverty in the United States in 1979, 1985, and 1990. They devise new statistical inference procedures, consider two distinct income measures, and report their results for three different poverty lines. They analyze the official poverty line and make use of Census money income, so one set of their estimates is directly comparable to the official poverty measures. They also consider poverty lines 25 percent above and 25 percent below the official (Orshansky) thresholds and present evidence for a comprehensive income measure as well as the more restrictive concept used in the official poverty statistics. The different income measures have considerable impact upon regional poverty, and it is helpful to briefly elaborate on how income is measured. The differences between Census money income and the comprehensive income concept measure that Bishop, Formby and Zheng (1994) use are revealed by the following definitions:

$$\begin{array}{l}
 \text{Census} \\
 \text{Money} = \\
 \text{Income}
 \end{array}
 \left[ \begin{array}{c}
 \text{Wages and Salaries} \\
 + \\
 \text{Self-Employment Income} \\
 + \\
 \text{Dividends, Rents and Interest} \\
 + \\
 \text{Cash Transfers (e.g., AFDC)}
 \end{array} \right]$$

and

$$\begin{array}{l}
 \text{Comprehensive} \\
 \text{Income}
 \end{array}
 =
 \begin{array}{l}
 \text{Census} \\
 \text{Money} + \\
 \text{Income}
 \end{array}
 \left[ \begin{array}{ll}
 \text{Market Value} & \text{Federal Income} \\
 \text{of Food Stamps} & \text{Taxes} \\
 + & + \\
 \text{Market Value} & \text{State Income} \\
 \text{of Housing Subsidies} & \text{Taxes} \\
 + & + \\
 \text{Market Value} & \text{Payroll Taxes} \\
 \text{of Energy Subsidies} & - \\
 + & \\
 \text{Market Value} & \text{Earned Income} \\
 \text{of SchoolLunch Program} & \text{Tax Credit} \\
 + & \\
 \text{Market Value} & \\
 \text{of WIC Program} &
 \end{array} \right]$$

Table 5 summarizes the regional Sen poverty indices for 1979, 1985, and 1990 that are estimated using the official poverty line. The changes in poverty across time that Bishop, Formby and Zheng (1994) find to be statistically significant from zero are indicated by asterisks. Tables 6 and 7 show comparable information when estimates are made using poverty lines that are respectively 25 percent below and 25 percent above the official poverty thresholds. Inspection of tables 5, 6, and 7 reveals that the major impact of moving the poverty line up or down is to increase or decrease measured poverty in each of the regions. In one instance (the West, comprehensive income, 1979-1985) changing the poverty line influences the finding concerning whether a rise in poverty is statistically significant. However, for the most part, drawing the poverty line at a higher or lower income threshold has little impact on the statistical findings concerning changes in regional poverty across time.

To address the question of which U.S. region has the least poverty and which region has the most we summarize Bishop, Formby and Zheng's statistical rankings of Sen indices using the Hesse diagrams in figure 5. Figures 5a, 5b, and 5c show the orderings of regional poverty in 1979, 1985, and 1990 in terms of the Census money income, while figures 5d, 5e and 5f show the regional orderings for the same years in terms of comprehensive income. In each Hesse diagram, regions with the lowest level of poverty are at the top of the diagram, regions that have Sen indices that are not significantly different are ranked on the same level, and regions ranked at the bottom have the most severe poverty. Figure 5 clearly illustrates the advantages of an inference-based analysis of poverty; five of the six Hesse diagrams show examples of regions that are not significantly different from one another, a finding that is virtually impossible using simple comparisons of point estimates.

Now consider the regional rankings in terms of Census money income shown in figures 5a, 5b, and 5c. The statistical rankings suggest two general conclusions. The Midwest and West are at the top diagram, indicating that they have significantly less poverty when evaluated in terms of Sen's distribution-sensitive measure. Conversely, the South and Northeast are almost always at the bottom, which means these regions have significantly more poverty than the West and Midwest when Census money is the metric. A quite different pattern emerges when the comprehensive income measure is used. The Mid-

**Table 5. Sen Indices of Regional Poverty Estimated Using the Official Poverty Line, 1979, 1985, and 1990**

<b>5a. Census Money Income</b>				
<b>Time period</b>	<b>Northeast</b>	<b>Midwest</b>	<b>South</b>	<b>West</b>
1979	0.044	0.035	0.059	0.038
1985	0.081	0.061	0.073	0.056
1990	0.083	0.064	0.086	0.071
Percent change 1979-1985	85.2**	115.9**	25.5**	25.9**
Percent change 1985-1990	2.2	3.8	17.2**	25.9**

<b>5b. Comprehensive Income</b>				
<b>Time period</b>	<b>Northeast</b>	<b>Midwest</b>	<b>South</b>	<b>West</b>
1979	0.022	0.020	0.025	0.027
1985	0.025	0.027	0.038	0.032
1990	0.069	0.048	0.067	0.061
Percent change 1970-1985	15.5	32.8**	48.6**	17.5**
Percent change 1985-1990	172.3**	80.1**	81.2**	88.2**

\*\*Significant at the 1 percent level.

west continues to be ranked at the top; in each of the years considered, the Midwest's Sen index is lower or as low as any other region. However, in the other regions there are significant changes in Sen index rankings. This is most dramatic for the Northeast. In 1979 and 1985, poverty measured in terms of comprehensive income in the Northeast was no different from the Midwest and was significantly less than in the West and South. But in 1990, the Northeast's Sen index was significantly larger than those of the West and Midwest and had increased to a level such that it was not significantly different from the Sen index in the South.

**Table 6. Sen Indices of Regional Poverty Estimated Using a Poverty Line 25 Percent Below the Official Threshold, 1979, 1985, and 1990**

<b>6a. Census Money Income</b>				
<b>Time period</b>	<b>Northeast</b>	<b>Midwest</b>	<b>South</b>	<b>West</b>
1979	0.024	0.020	0.034	0.024
1985	0.051	0.040	0.050	0.035
1990	0.054	0.041	0.057	0.043
Percent change 1979-1985	111.6**	100.0**	44.2**	48.1**
Percent change 1985-1990	5.9	2.5	14.5**	22.6**

<b>6b. Comprehensive Income</b>				
<b>Time period</b>	<b>Northeast</b>	<b>Midwest</b>	<b>South</b>	<b>West</b>
1979	0.013	0.013	0.034	0.018
1985	0.015	0.017	0.050	0.020
1990	0.039	0.026	0.057	0.035
Percent change 1970-1985	14.4	30.7**	59.7**	8.2
Percent change 1985-1990	159.6**	56.6**	66.1**	116.8**

\*\*Significant at the 1 percent level.

The entire pattern of Sen measures of regional poverty among regions and across time suggests the following conclusions. The Midwest is at the top of the rankings in all but one case (Census money income, 1985), where it is ranked in the second position. The South is generally ranked toward the bottom of the Hesse diagrams, indicating that it usually has significantly greater poverty than other regions for both measures of income. In contrast, the ranking of the Northeast and West are sensitive to the income definition and the time period. For example, in 1979, the West is ranked at the top of the Census income diagram (lowest poverty) but at the bottom of the comprehensive



**Table 7. Sen Indices of Regional Poverty Estimated Using a Poverty Line 25 Percent Above the Official Threshold, 1979, 1985, and 1990**

<b>7a. Census Money Income</b>				
<b>Time period</b>	<b>Northeast</b>	<b>Midwest</b>	<b>South</b>	<b>West</b>
1979	0.067	0.054	0.086	0.055
1985	0.114	0.084	0.100	0.080
1990	0.112	0.087	0.118	0.101
Percent change 1979-1985	70.0**	56.4**	16.3**	47.0**
Percent change 1985-1990	-1.7	3.9	17.9**	26.1*

<b>7b. Comprehensive Income</b>				
<b>Time period</b>	<b>Northeast</b>	<b>Midwest</b>	<b>South</b>	<b>West</b>
1979	0.034	0.031	0.040	0.040
1985	0.040	0.041	0.055	0.048
1990	0.101	0.074	0.1002	0.092
Percent change 1970-1985	16.3	32.0**	36.8**	20.8
Percent change 1985-1990	153.3**	80.1**	83.5**	90.9**

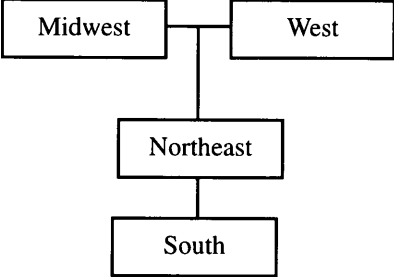
\*Significant at the 5 percent level

\*\*Significant at the 1 percent level

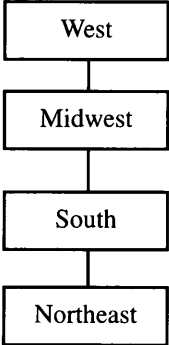
income diagram (highest poverty). The most striking differences, which reflect fundamental changes, occurred in the Northeast. For example, in 1985 the Northeast was at the top of the comprehensive income ranking and at the bottom of the Census money income ranking. There is also great variability in Northeastern poverty across time—between 1985 and 1990 the Northeast falls from the top to the bottom of the regional ranking in terms of comprehensive income. Over the entire decade, the Northeast changed from having quite low poverty compared to other regions, to having significantly greater poverty than the West and Midwest and the same poverty as the South. If reliable methods for correct-

**Figure 5. Hesse Diagrams for Statistical Rankings of Sen Indices of Poverty by Region and Income Measures, 1979, 1985, and 1990\***

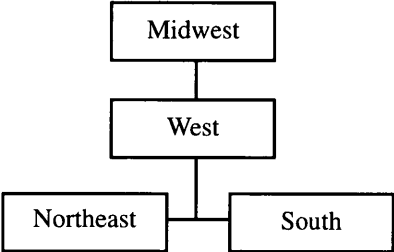
**5a. Census Money Income, 1979**



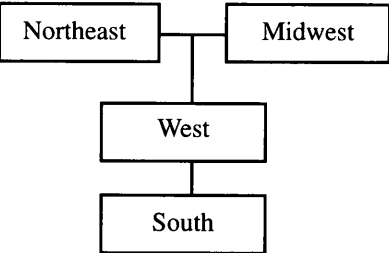
**5b. Census Money Income, 1985**



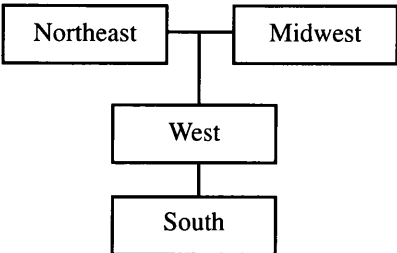
**5c. Census Money Income, 1990**



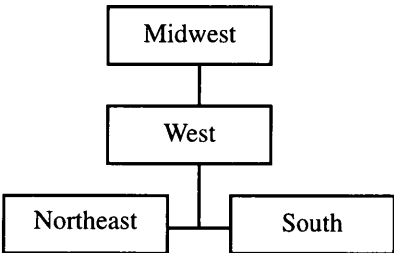
**5d. Comprehensive Income, 1979**



**5e. Comprehensive Income, 1985**



**5f. Comprehensive Income, 1990**



\*The higher a region is in the ranking, the lower the Sen index of poverty. Two regions on the same level indicate that the null hypothesis of no difference in Sen indices cannot be rejected.

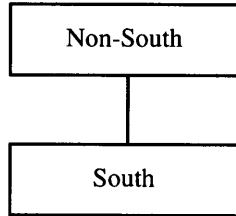
ing absolute incomes for differences in regional costs of living were available, then the problem of poverty in the Northeast would, in all likelihood, be revealed to be even more severe.<sup>9</sup>

### *Regional Income Inequality*

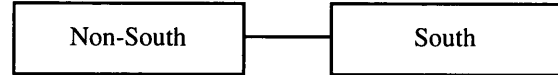
Advances in the measurement of regional income inequality have been made possible by the development of statistical inference procedures for Lorenz dominance. The original test procedure was proposed by Beach and Davidson (1983), with important improvements and extensions by Beach and Kalisky (1986) and Bishop, Formby, and Thistle (1989). The new methods have been applied to large samples drawn from the public use computer files of the Census of Population and used by Bishop, Formby and Thistle (1992, 1994) to measure U.S. regional income inequality. As noted above, the use of micro data allows the income receiving unit to be defined in alternative ways and the results reported below are for three widely used definitions: the household, which is the basic sampling unit in income surveys; per capita household; and “needs-adjusted” equivalent persons per household, with the latter based upon the equivalence scale implicit in the Orshansky poverty thresholds.<sup>10</sup> Bishop, Formby and Thistle present results for the South and non-South (1992) and for major regions (1994) in 1969 and 1979. Figure 6 summarizes their findings in a Hesse diagram that shows the statistical rankings. Figure 6a indicates that in 1969 there were no statistically significant differences among the Lorenz curves of the major regions comprising the non-South, and all three non-South regions Lorenz dominated the South. Thus, regional differences in inequality in 1969 represented a continuation of the historical pattern that prevailed throughout much of the nineteenth and twentieth centuries. In the 1970s, fundamental changes occurred in the regional income distributions of the United States that resulted in convergence of the South’s Lorenz curve to the rest of the country.<sup>11</sup> Using a confidence level of 99 percent, Bishop, Formby and Thistle (1992) show that the null hypothesis of no difference between the Lorenz curves of the South and non-South<sup>12</sup> cannot be rejected for any of the definitions of the income-receiving unit.<sup>13</sup> The convergence of the South’s Lorenz curve to the Lorenz curve of the rest of the country

**Figure 6. Hesse Diagrams for Statistical Rankings of Regional Lorenz Curves for Three Definitions of the Income Receiving Unit**

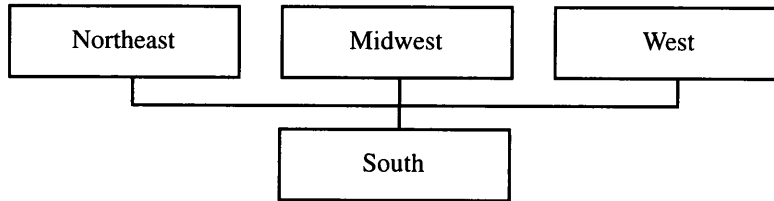
**Figure 6a. 1969**  
*South versus Non-South*



**Figure 6b. 1979**  
*South versus Non-South*



*Major Regions*



*Major Regions*

Statistical comparisons yield mixed results depending upon the definition of the income receiving unit

\*The three definitions of the recipient unit are the household, per capita household, and “needs adjusted” equivalent number of persons per household, where the equivalence scale implicit in the Orshansky poverty thresholds are used to determine needs

is indicated by the equivalence of the South and non-South at the top of figure 6b.

In a second study, Bishop, Formby, and Thistle (1994) decompose the non-South into the component subregions and show that while the South was *converging* to the non-South, which is an aggregation of the Northeast, Midwest and West, the regions of the non-South were *diverging* from one another. The Lorenz curves of the major regions in 1979 are sensitive to the definition of the income-receiving unit and are not easily described with a Hesse diagram. Nevertheless, several interesting results reported by Bishop, Formby and Thistle (1994) are worth noting. First, for household Lorenz curves, there are statistically significant differences between component regions of the non-South in 1979. There are also no differences in inequality between the South, Midwest and West. However, the Midwest Lorenz dominates the South. Second, for per capita incomes, the Northeast and West Lorenz curves appear to have been equivalent. But the Midwest dominates the Northeast and South and is dominated by the West. For the needs-adjusted Lorenz curves, the pattern of regional inequality in 1979 is even more complex. Pairwise Lorenz comparisons of the West and South, Midwest and Northeast and Midwest, and West and Northeast suggest equivalent needs-adjusted relative inequality. However, the inference tests indicate that in 1979, the needs-adjusted Lorenz curve of the West dominated the Midwest, while the South was dominated by both Midwest and Northeast.

The changes in regional income inequality in the 1970s were dramatic and lead to the natural question of what factors account for the observed patterns. Economists have been expecting and predicting the convergence of the South and non-South for a long time, but the diverging income distributions in the regions of the non-South are more difficult to explain. The integration of labor and capital markets and the free flow of resources between the North and the South tends to lead to equalization of factor prices and income in the long run. Thus, it is scarcely surprising that the South finally converged or almost converged to the rest of the United States. It is more difficult to explain why the income distributions of the Northeast, Midwest, and West diverged in the 1970s. Bishop, Formby and Thistle (1994) offer a tentative explanation of this surprising development. They suggest that the 1970s was a period of disequilibrium in terms of regional income dis-

tributions that reflected a more open U.S. economy and international trade, rising relative prices of energy, rapid technological change, and massive flows of highly educated and skilled workers out of the Northeast and, to a certain extent the Midwest, to the South and West. If this explanation is correct, it is reasonable to expect the regions of the non-South to eventually converge so that they are again statistically equivalent when evaluated in terms of Lorenz dominance.

Regional inequality in the 1980s and 1990s has not been studied with the same intensity as the 1960s and 1970s, and Bishop, Formby and Thistle's work has not been replicated for the more recent period. However, Bishop, Formby and Smith (1992) have applied the same inference-based Lorenz dominance methodology to annual CPS survey data and documented a massive rise in overall U.S. income inequality during the period 1978 to 1983. Relative inequality continued to rise in the United States as a whole into the late 1980s, but recently the rise seems to have abated. When regional inequality during this period is studied, it will be surprising if the unprecedented increases in the late 1970s and 1980s did not also involve significant regional changes in inequality.

## **Conclusions and Policy Implications**

Since the early work of Watts (1968), it has been recognized that poverty is a multidimensional concept, and that the social and economic problems associated with it do not disappear when one crosses a particular income line. Nevertheless, economic definitions and measurement are essential if we are to understand poverty and be in a position to evaluate policy proposals that influence the well-being of a large segment of our population. The work of philosopher John Rawls (1971) would have us evaluate the well-being of an entire society by focusing on the poorest individual. Many people are probably unwilling to accept Rawls' stringent criterion; a proposition that would likely garner more widespread support among most Americans is that when poverty significantly increases, there can be no claim of an overall improvement in the economy even if the average income rises or the middle class benefits. Further, many would accept the proposition that

substantial and rising disparities in poverty across regions and among other population subgroups is another relevant dimension along which the overall well-being of a society can be judged.

If the last two propositions are accepted as axioms for use in evaluating policy proposals, then they have immediate implications for welfare reform, middle class tax cuts, and the proposal to end unfunded federal mandates to state governments that is being widely discussed in Washington at the present time. Many Americans perceive that the system of public welfare jointly administered by states and the federal government is in need of reform, and over the last several years a new political coalition has emerged and it now seems possible that substantial changes will be enacted. Both major political parties have legislative plans to reduce transfers to the poor and use the proceeds to fund a revenue neutral tax to what is variously described as the "middle class." Further, the President is committed to "ending welfare as we know it" and to a middle class tax cut. In addition, there is a major push that has strong bipartisan support to end unfunded federal mandates to state governments. Thus, the mid 1990s seem to be a period in which Director's Law of Income Redistribution is likely to apply with a vengeance. Director's Law (Stigler 1970) holds that political competition for the support of the middle class will lead democratic governments to redistribute income to families in the middle of the income distribution. In principle, the Law is symmetrical with respect to persons in the upper and lower tails of the distribution, but today those who appear most likely to lose from the operation of Director's Law are welfare recipients at the bottom of the income distribution.

Regardless of the intent of the proposed policy shifts and irrespective of the long-run effects of such changes on welfare dependency, there are short-run impact effects of the policies currently being discussed that are not well understood and which have important implications for economic well-being. When Sen proposed his poverty index in 1976, he observed that measures of poverty that emphasized only the poverty line and the headcount ratio provided policy makers with the option of playing games; they can implement policies that they can claim make things better, while in fact they are making them worse. Suppose the policy makers are interested in headlines and 30-second sound bites and are in fact seeking to get reelected by implementing

Director's Law. What are they likely to do? It seems that they will do pretty much what Sen anticipated.

I want to conclude with the description of a simple simulation to investigate the redistributive effects of welfare reform. In 1994 I began working on the relationship of the food stamp program to poverty and have a very nice data set on comprehensive incomes and food stamps. In order to gauge the effects of reforming the food stamp program, I simulated the effects of cutting this aspect of the welfare program. Revenue saved by cutting food stamps was statistically redistributed in a revenue-neutral manner by lowering middle class tax rates. Cuts of 25 percent, 50 percent, 75 percent, and 100 percent were simulated, which generated quite a lot of revenue to finance redistributions to the middle class. What impact would cuts of this magnitude have on poverty? If only the official poverty statistics are considered, the answer is nothing; food stamps are not counted as a part of Census money income. On the other hand, if the official poverty line and measurement methodology are applied to comprehensive income, the simulations suggest that headcount poverty increases only slightly, but the poverty gap, the Gini index among the poor and the Sen index all rise substantially more. The simulations suggest the following effects of completely eliminating the food stamp program:

Census Money Income

Official Poverty Statistics	No Change
-----------------------------	-----------

Comprehensive Income

Headcount Poverty Rate	+ 7.9%
Poverty (Income) Gap Ratio	+13.3%
Gini Index of the Poor	+13.5%
Sen Index of Poverty	+20.2%

These simulations strongly suggest that, if enacted, the current policy proposals will seriously aggravate the problem of poverty in America. If the axioms advanced above are accepted, then the short-run impacts of welfare reform policies will be to lower the overall economic well-being of the country.



I now conclude by pointing out that I have not simulated the effects of welfare reform on regional poverty or on other population subgroups, but the short-run impacts are predictable. Overall, poverty will rise and poverty among vulnerable groups such as children is likely to rise substantially more than the average. Reforming the food stamp and the AFDC program are likely to have a quite different regional impact on poverty. The reason for this is that the size of AFDC payments varies widely from state to state; the maximum payments are generally much smaller in the South than in the non-South. For example, in 1991, Alabama's maximum AFDC payment for a family of three was \$124, whereas Michigan's maximum was \$555. Clearly, federal cuts in AFDC would be much more severe in the non-South. In contrast, food stamps are allocated on the basis of Census money income, and there is much less regional variation. But even in the case of food stamp reform, I expect that there will be significant differences in the regional impacts of welfare reform.

## NOTES

1 Smolensky, Danziger and Gottschalk (1988) apply the Orshansky measurement procedures to samples drawn from the 1940 and 1950 decennial Census of Population, which contains income data for 1939 and 1949. The measurement procedures cannot be replicated exactly, but their estimates indicate that 68.1 percent of Americans were poor in 1939, and 39.7 percent were in poverty in 1949.

2 The incidence of poverty among children has been rising more rapidly than in the general population. On this point see Smolensky, Danziger and Gottschalk (1988).

3 Other data sources could be used but they involve either much smaller samples or they are not truly representative of the regional populations of interest.

4 The Lorenz curve for 1949 in figure 3a crosses the Lorenz curve for 1989 in figure 3b.

5 Census money income includes wages and salaries + self-employment income + dividends, rents, and interest + cash transfers.

6 See, for example, Braun (1988).

7 See Davies and Hoy (1994) and Formby and Zheng (1994) for discussions of this issue and the improved procedures.

8. Surveys containing more than one observation of income in two or more time periods are said to contain "panel data," which means the researcher can use alternative accounting periods for measuring income, poverty, and inequality. The March CPS survey contains observations for two consecutive years for approximately one-half the households surveyed each year. The Survey of Income and Program Participation (SIPP) contains thirty monthly observations, which means the accounting period can vary from one month up to 2.5 years. The Consumer Expenditure Survey contains quarterly data for five quarters. The longest panels that are broadly representative of the entire population are Panel Study of Income Dynamics (PSID) and the Internal Revenue Service's continuous Work History File, which contain annual income observations for extended time periods.

9 Variations in the regional cost of living are widely recognized to be a problem when poverty is measured using absolute incomes. See, for example, the General Accounting Office's *Federal Aid. Revising Poverty Statistics Affects Fairness of Allocation Formulas* (1994). Unfortunately, there are no consistent and reliable measures of differences in regional cost of living across time. A number of researchers including Tremblay (1986) and Bishop, Formby, and Thistle (1992, 1994) have used the Bureau of Labor Statistics' *Three Budgets for an Urban Family of Four Persons* (U.S. Department of Labor 1979) to construct valid regional cost of living indices for the 1960s and 1970s. Unfortunately, a key statistical series required to estimate regional costs of living using this methodology was discontinued by the Bureau of Labor Statistics in response to Reagan administration budget cuts in the early 1980s.

10 Cowell (1984) reviews alternative definitions of the income-receiving unit and suggests criteria for limiting the number considered. The three definitions considered correspond to the approaches he most strongly recommends. It is worth pointing out that all adjustment of the micro data to obtain alternative recipient units are completed prior to grouping the data into deciles and conducting statistical tests. For example, a four-person household with total income of \$30,000 is included in the per capita household income-receiving unit as four separate incomes of \$7,500 each. For a four-person household, the Orshansky needs index is 1.95 and four needs-adjusted incomes of \$15,384.62 are included in the needs-adjusted equivalent person income distribution.

11 There is a growing literature on regional convergence that focuses on absolute incomes. See, for example, Barro and Sala-i-Martin (1991, 1992), who focus on regional growth and the convergence of per capita mean incomes. Bishop, Formby, and Thistle (1992, 1994) analyze convergence of entire income distributions and consider both absolute and relative incomes.

12 Micro data allow the regions to be defined by a combination of states. To enhance the comparability of their results, Bishop, Formby, and Thistle (1992) use the Census definitions of the South, which includes AL, AR, DE, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, WV, and Washington, DC. The remaining contiguous states make up the non-South.

13 This result is sensitive to the confidence level of the test. If a 5 percent test is used, convergence is complete for the per capita and needs-adjusted Lorenz curves. However, the Lorenz curve of household income, the south had not quite converged in the bottom decile. On this point, see Bishop, Formby, and Thistle (1992).

## References

- Atkinson, Anthony B. 1970. "On the Measurement of Inequality," *Journal of Economic Theory* (September): 244-263.
- Barro, Robert J., and Xavier Sala-i-Martin. 1991. "Convergence across States and Regions," *Brookings Papers on Economic Activity* 1: 107-182.
- \_\_\_\_\_. 1992. "Convergence," *Journal of Political Economy* (April): 223-251.
- Beach, Charles M., and Russell Davidson. 1983. "Distribution-Free Statistical Tests for Income Shares and Lorenz Curves," *Review of Economic Studies* (October): 723-734.
- \_\_\_\_\_. 1985. "Joint Confidence Intervals for Income Shares and Lorenz Curves," *International Economic Review* (June): 439-450.
- Beach, Charles M., and Stephen F. Kaliski. 1986. "Lorenz Curve Inference with Sample Weights: An Application to the Distribution of Unemployment Experience," *Applied Statistics* 1: 38-45.
- Bishop, John A., John P. Formby, and W. James Smith. 1991. "Lorenz Dominance and Welfare: Changes in the U.S. Distribution of Income, 1967-1986," *Review of Economics and Statistics* (February): 134-139.
- Bishop, John A., John P. Formby, and Paul D. Thistle. 1989. "Statistical Inference, Income Distribution and Social Welfare." In *Research on Economic Inequality*, Vol. 1, Daniel J. Slottje, ed. Greenwich, CN: JAI Press.
- \_\_\_\_\_. 1992. "Convergence of the South and Non-South Income Distributions, 1969-1979," *American Economic Review* (March): 262-272.
- \_\_\_\_\_. 1994. "Convergence and Divergence of Regional Income Distributions and Welfare," *Review of Economics and Statistics* (May): 228-235.
- Bishop, John A., John P. Formby, and Buhong Zheng. 1994. "Inference Tests for Sen's Poverty Index with an Application to Regional Poverty in the United States." Working Paper No. 240, University of Alabama.
- Braun, Denny. 1988. "Multiple Measures of U.S. Income Inequality," *Review of Economics and Statistics* (August): 398-405.
- Cowell, Frank. 1984. "The Structure of American Income Inequality," *Review of Income and Wealth* (September): 351-375.
- Davies, James, and Michael Hoy. 1994. "Making Inequality Comparisons When Lorenz Curves Intersect," *American Economic Review* (May): 980-986.
- Formby, John P., and Buhong Zheng. 1994. "Unanimous Inequality Rankings and Normalized Stochastic Dominance." Working Paper No. 239, University of Alabama.

- Orshansky, Mollie. 1964. "Counting the Poor: Another Look at the Poverty Profile," *Social Security Bulletin* (June): 387-406.
- Rawls, John. 1971. *A Theory of Justice*. Cambridge, MA: Harvard University Press.
- Sen, Amartya K. 1976. "Poverty: An Ordinal Approach to Measurement," *Econometrica* (March): 219-231.
- Smolensky, Eugene, Sheldon Danziger, and Peter Gottschalk. 1988. "The Declining Significance of Age in the United States: Trends in the Well-Being of Children and the Elderly Since 1939." In *The Vulnerable*, John L. Palmer, Timothy Smeeding, and Barbara Boyle Torrey, eds. Washington DC: Urban Institute Press.
- Stigler, G. 1970. "Director's Law of Public Income Redistribution," *Journal of Law and Economics* (April): 1-10.
- Tremblay, Carol H. 1986. "Regional Wage Differentials: Has the South Risen Again?" *Review of Economics and Statistics* (February): 175-178.
- Watts, Harold. 1968. "An Economic Definition of Poverty." In *On Understanding Poverty*, Daniel P. Moynihan, ed. New York: Basic Books.
- Williamson, Jeffrey G. 1977. "Unbalanced Growth, Inequality, and Regional Development: Some Lessons from U.S. History." In *Alternatives to Confrontation: A National Policy Toward Regional Change*, V.L. Arnold, ed. Lexington, MA: Lexington Books.
- Wright, Gavin. 1987. "The Economic Revolution in the American South," *Journal of Economic Perspectives* (Summer): 161-178.
- U.S. Department of Labor. 1979. *Three Budgets for an Urban Family of Four Persons*, Washington DC: Bureau of Labor Statistics.
- U.S. General Accounting Office. 1994. "Federal Aid: Revising Poverty Statistics Affects Fairness of Allocation Formulas." GAO, Washington, DC.
- U.S. Bureau of the Census. 1981. "Characteristics of the Population Below the Poverty Level: 1979," by Carol Fendler and Arno I. Winard. *Current Population Reports*, series P-60, No. 130. Washington, DC: U.S. Government Printing Office.
- \_\_\_\_\_. 1990. "Poverty in the United States: 1988 and 1989," by Mark S. Littman and Eleanor F. Baugher. *Current Population Reports*, series P-60, No. 171. Washington, DC: U.S. Government Printing Office.
- \_\_\_\_\_. 1993. "Poverty in the United States: 1992," by Eleanor F. Baugher and Martina Shea. *Current Population Reports*, series P-60, No. 185. Washington, DC.: U.S. Government Printing Office.