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SOCIAL POLICY & U.S. POVERTY 1960-1999: An Economic History

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Abstract

Interrogates poverty debate (growth versus redistribution) reignited by underperforming poverty reductions during 1980s' social spending austerity compared to 1960s' "War on Poverty." Growth and inequality explain 75% 1959-1999 poverty variation; census measurement changes 17%. Significantly, census measurement changes plus overestimated inflation biased-up 1980s measured poverty (deflated 1960s) partly explaining eighties' underperformance. Growth's poverty effect remained constant; rising inequality required 1980's growth 50% higher (1960s) for equivalent poverty reductions. Counterfactual simulations 1959-1999: absent rising *earnings* inequality, growth drives poverty to 5.4%; increased workerless households offset two-thirds poverty reduction from cash transfers; had Carter and Reagan redistributed like predecessors, poverty reduced one-half.

Keywords: poverty, growth, inequality, income transfers, counterfactuals

JEL Classification Codes: 0N12, 0N32.

1. **Introduction**

Four simple words summarize social policy toward poverty during the 1960s; growth is not enough! Thus, the policies most closely associated with that part of President Lyndon Baines Johnson's Great Society known as "the War on Poverty" (social income transfers and worker training programs for the disadvantaged), were redistributive and predicated on the proposition that increased economic growth would be insufficient to eliminate poverty. The *Economic Report of the President* for 1964 enunciated the point clearly. Referring to the success of ongoing policies stimulating income growth and prosperity, the Report acknowledged increased growth had left many families "behind" and argued (CEA, 1964: 72):

> in the future economic growth alone will provide relatively few escapes from poverty. Policy will have to be more sharply focused on the handicaps that deny the poor fair access to the expanding incomes of a growing economy.

Skeptical that economic growth could reduce systemic forms of poverty deemed immune to changes in macro policy, the Kennedy-Johnson Administrations emphasized a two front attack on domestic problems: they conjoined policies promoting economic growth and general prosperity with special social welfare programs targeted at the most recalcitrant pockets of poverty. Introducing the concept of the "poverty line" that would become future administrations' official definition of poverty, LBJ, declaring "unconditional war on poverty in America" in his first State of the Union Address during January 1964, declared, "we cannot and need not wait for the gradual growth of the economy to lift this forgotten fifth of our Nation above the poverty line" (Schlesinger:1005-6; CEA, 1964:15)

The Kennedy-Johnson poverty policy was a controversial departure from economic policies that relied mainly on economic growth to conquer poverty. The departure drew immediate rebuttals from many policy makers and economists. Thus, Lowell Galloway (1965), questioning the need for selective antipoverty programs (e.g. the War on Poverty), argued his econometric forecasts showed economic growth would decrease the 1980 poverty rate well below that estimated by the CEA. The dissent precipitated a technical debate in the *AER* concerning "how rapidly will economic growth and full employment acting alone reduce the proportion of people living in poverty" (Aaron:1234; Galloway, 1967:1241-2). As a practical matter, the social experiment producing data required to test the issue would not occur until the onset of an era of strong fiscal conservatism initiated by Jimmy Carter in 1977 and ratified by the Reagan Administration's counterrevolution against social policy activism throughout the 1980s. Why, contemporaries asked, was poverty so high during the high growth years of the 1980s?

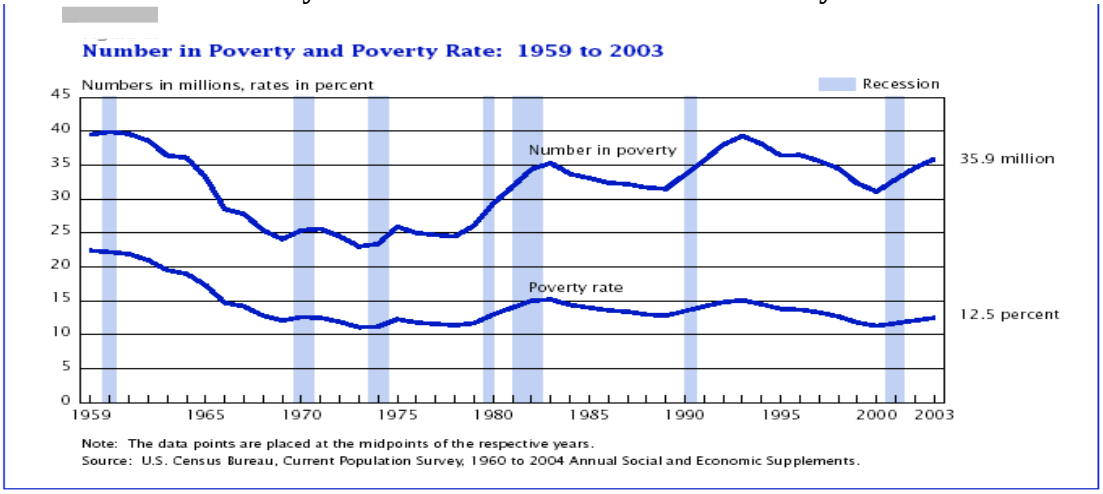
This paper exploits the social experiment created by the starkly alternative policy regimes to examine the issues with the conceptual tools of economic history. To frame issues within their historical context, unlike previous approaches, the econometric design permits direct comparison of growth versus "inequality," and, importantly, accounts for changes in how the Census bureau measured policy over time. The remainder of the paper contains five sections. Section 2 provides a data driven historical overview of movements in poverty, income growth, and social expenditure policies from 1959 to 2001. This overview contextualizes one of mid-twentieth century Americans' most contentious policy disagreements framing the debate in terms of economic historian's most important conceptual tool, several counterfactual conditionals concerning the efficacy of economic growth versus social income transfers in reducing poverty during a period of rapidly rising inequality. Assessing the counterfactuals necessitates disentangling complex relationships among economic and social variables. Section 3 summarizes previous econometric approaches to the related problem of explaining poverty in terms of income growth and covariates of inequality (such as unemployment) providing a context for understanding section 4's discussion of the approach used in this paper that builds on one recent strand of the literature on inequality. Section 4 introduces an econometric model designed to produce simulations capable of interrogating several historical counterfactuals. It decomposes and estimates the independent effects on changes in poverty of factors with direct effects (mean income, income inequality, changes in poverty definition) and of factors effecting poverty indirectly through their effects on income inequality (e.g. earnings inequality, cash transfers, female-headed families). Section 5 estimates the model, and section 6 uses the results of the model to present simulations designed to test the posed counterfactuals of section 2. Appendices examine robustness, discuss data and model assumptions, and present a mathematical result crucial to the econometric design.

2. Poverty 1961-1974: 1977-1989: Two Social Welfare Policy Regimes

Between the recession years 1959 and 2001, the CPS rate of poverty for persons declined on average about a quarter of a point per year. Exhibiting a standard deviation of about three-quarters of a point, annual changes in poverty were far from smooth. Poverty declined sharply and steadily during the 1960s and early 1970s but, (see Figure 1), the downward trend in poverty stalled during the mid-1970s when previously declining poverty rates turned back upon themselves. Beginning with the late 1970s poverty exhibits two sharp and abrupt upward movements each followed by a descent beguiling contemporaries into believing poverty was returning to the low baseline set in the early seventies.

Much of the volatility in poverty derived from instability of the macrodistribution of income by which I mean the cyclical effects of macroeconomic performance on measures of aggregate income and inequality. Over the four decades, the economy generated average annual increases in the real mean income of families of $872 per year. Again, a large standard deviation ($1147) indicates great volatility as the business cycle frequently interrupted the ameliorative effects of economic growth on incomes and poverty. Changes in inequality suggest similar observations. Family income's gini coefficient increased on average slightly less than .002; its standard deviation of (.006) reminds us that changes in the shape of the income distribution (like its location) were frequent and an important source of change in poverty.

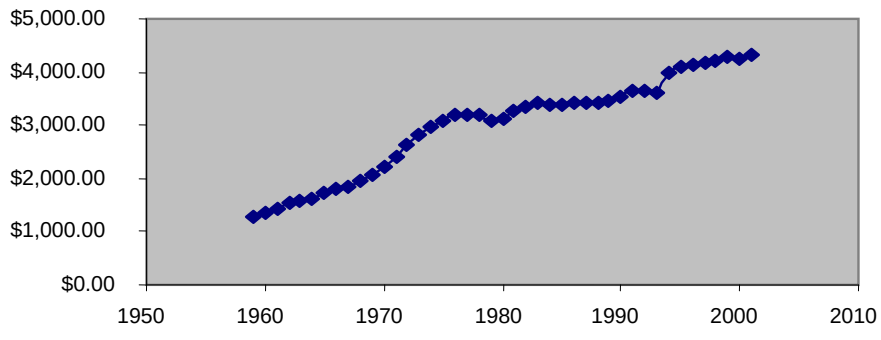
Figure 1
Poverty and the Performance of the Economy



The proximate cause of these adverse movements in poverty became a subject of intense debate. The central question underlying the debate can be simply framed: during a period of considerable economic expansion, why was the poverty rate so high during the 1980s? Of intrinsic interest to historians and of practical import to ongoing policy debates, important strands of the historical debate concerned the extent to which the slowdown in poverty reduction could be attributed to inadequate economic growth, misguided social welfare policies, or increases in inequality that were abetted by stringent income transfer policies (Gabe, 1983; Gottschalk and Danziger, 1985;Sawhill, 1988; Murray, 1984). During the final decades of the 20th Century, both real disturbances to the economy and social policy varied widely. In combination, the variations in macroeconomic performance and social policy choices produced a rich database for examining the relationship between poverty, growth and inequality, and society's income redistribution policies. In particular, distinct policy regimes defined by sharp turns in each of these variables separate the period 1961–1974 from 1977-1989.

Gerald Ford's Presidency (1974-1976) serves as transition between policy regimes characterized by Presidential Administrations targeting redistributive social policies toward the poverty problem and Administrations curtailing redistributive impulses in favor of fiscal restraint toward poverty reduction. The break in policy toward the poor is usually attributed to the Reagan Administration, but, in fact, the decisive turning point occurred under Jimmy Carter who believed he had been elected "to bring fiscal responsibility to the federal government" (Hou:21). From 1960 through 1973, federal cash social welfare transfers per household grew at an average annual rate of 5.8%; the three years with Gerald Ford's imprint averaged 4.12%, see Figure 2.[1] After Ford and through 2001, transfers per household grew at an anemic 1.27%. Inheriting high inflation and slowed growth, Jimmy Carter initiated the fiscal austerity with respect to federal redistributive transfers. Managing cuts during two of his four years in office, Carter oversaw an average annual rate of decline of -.51% in cash transfers per household. The Reagan Administration continued Carter's policy of fiscal austerity toward social programs, perhaps, as Stein (1994:34) argues, taking the policy turn in an even more radical direction. Even so, during Reagan's eight years in office he merely equaled Carter's 2 years of cuts in such programs. The Carter-Reagan era of social welfare austerity, grew transfers per household only .63% annually.

Figure 2: Real Cash Income Transfers per Household



Cash Social Welfare transfer payments include: Social Security (old age and survivors); Social Security (disability); veterans education benefits; Supplemental security income; Family support payments to States and TANF; EITC; Veterans non-service pensions; Payments for foster care/adoption Assistance; Payment where Child credit exceeds tax liability. Author converted fiscal year totals to calendar year totals for each category by linear interpolation. Data source: U.S. Government, Historical Tables, *Budget of the United States Government Fiscal Year 2004*, U.S. Government Printing Office, W.D.C. 2003, Table 11.3.

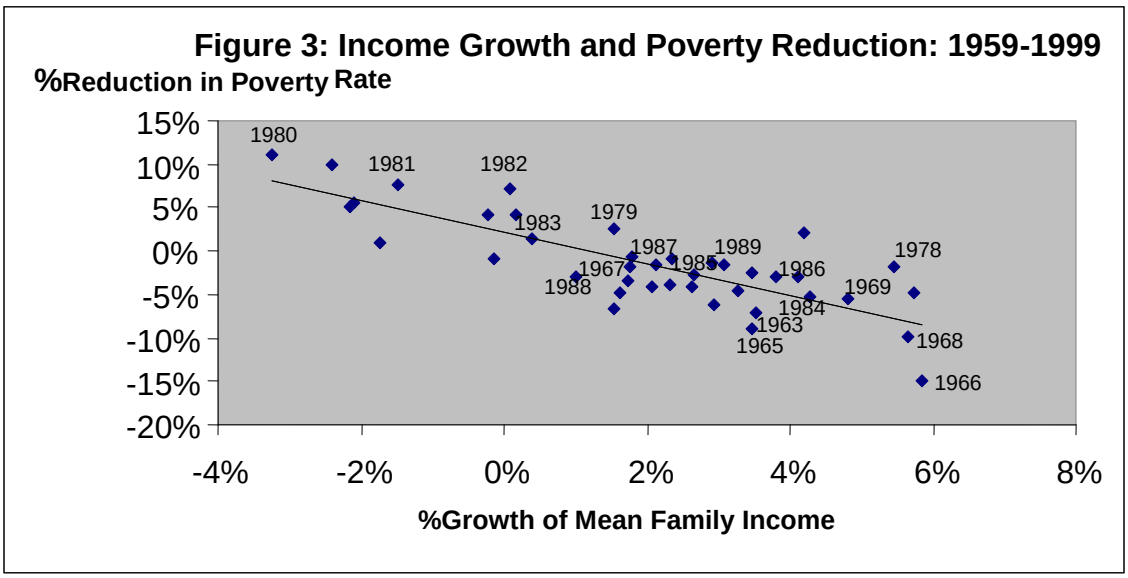
[1] These data exclude unemployment compensation, a cash transfer subject to the vagaries of the market and largely outside the discretion of Presidential budgeting. See source note at Figure 2.

Ronald Wilson Reagan championed economic growth disagreeing with the liberal proposition that growth of the economy alone was insufficient to ensure all Americans would share in national prosperity. Addressing the nation on the state of the economy just two weeks after assuming office he made his intentions clear, "Our aim is to increase our national wealth so all will have more, not just redistribute what we already have which is just a sharing of scarcity." Identifying its antipoverty program with economic growth, the Reagan Administration claimed that by distorting incentives social transfers thwarted growth and poverty reduction (Reagan; OMB, 1983: 31). The Administration traced the abysmal performance of the U.S. economy during the 1970s to the ill-advised policies of previous Administrations: excessive regulation of business, excessive taxation, and excessive spending on welfare (CEA, 1982). Implementation of economic policies aimed at correcting previous administrations' policy transgressions led to a decade of substantial economic growth but meager progress against poverty.

The seven year Reagan Era expansion (1983-89) during which income rose and unemployment fell every year, left the poverty rate at 12.8%, above the war on poverty's 12.1% legacy of 1969 and barely below the 13% rate bequeathed by President Carter in 1980. The experience of weak poverty reduction during a period of sustained income growth reinvigorated debate over the merits of social policies during the War on Poverty (especially redistributive income transfers). Both professional and partisan advocacy research contested the relative effects of redistributive income transfers versus growth as poverty reduction policies during the 1960s and 1980s. One side argued that the failure of 1980s growth to reduce poverty stemmed from fundamental economic realignments that increased inequality and required redistributive policies. The other side asserted obstinate poverty rates were a legacy of failed redistributive policies that realigned the social behavior of the poor against work and two-parent families causing poverty to rise (Gottschalk and Danziger, 1985: 153; Murray; OMB, 1983).

An initial look at the kind of evidence required to interrogate these counter claims supports two preliminary hypotheses. First, growth is a powerful destroyer of poverty; second, the poverty reduction prowess of economic growth appears to have lessened considerably during the periods of fiscal austerity against social income transfers (1977-1989) as compared to both earlier decades and the 1990s afterwards. Figure 3 depicts the simple OLS relationship between annual percentage growth of mean family income and annual percentage reductions (increases) in the poverty rate of persons for the U.S. economy from 1959 to 1999. Leaving aside the question of correct model specification for the moment, the regression shows a strong relationship between growth and poverty reduction. The regression

suggests, on average during the final four decades of the 20th Century, a one-percent increase in mean family income induced a 1.82 percent reduction in the poverty rate. Clearly, the relationship was not automatic. During some years, a one percent increase in mean family income appears to have reduced the poverty rate much more than during other years. Data points lie below the regression line for 18 of the forty years of data depicted in Figure 3. For those 18 years, the economy over performed reducing the poverty rate more than the expected reduction conditional on the growth of income. During 20 other years, growth underperformed reducing the rate less (or when growth was negative allowing poverty to rise more) than the predicted performance. Additionally, during two years (1983 and 1985) the data points virtually fall on the regression line suggesting growth reduced poverty by the amount predicted.



Equation of regression line is $\%\Delta Poverty = .02 - 1.82\%\Delta income$; $R^2 = .65$.

Years during which growth over or underperformed at reducing poverty are not distributed equally throughout the decades. The twelve years of Carter-Reagan social welfare austerity (30% of the entire period) account for just two years of over performance (11% of the over performing years). In turn, Carter-Reagan social welfare austerity accounts for eight (40%) of the years of underperformance. The underperformance of growth against poverty during the Carter-Reagan austerity period contrasts starkly with growth's performance during the sixties when poverty reduction exceeded the expected amount in six of the seven years of expansion running from 1962 through 1968. The contrast between the sixties and Carter-Reagan austerity could be the consequence of a fundamental shift in the efficiency with which growth reduced poverty after 1969. However, growth over performed in 3 of the 7 years between

The War on Poverty and Carter-Reagan austerity, and growth over performed again during 5 of the 10 years following, why?

The answers to our questions lie in the variables omitted from the regression relationship of Figure 3. Although economic growth is demonstrably the single most important determinant of movements in the poverty rate, it is not the only variable of consequence. For example, many analysts have argued unemployment is a major contributor to poverty, and one might think the simple regression of poverty movements on income growth ignores the effect of unemployment during the business cycle (Blank and Blinder, Blank, Cutler and Katz). And, indeed, Figure 1 clearly shows the sharpest movements in poverty and reversals in its direction occur at well-defined junctures of the business cycle; growth's under performance against poverty during 1980-1983 (as during 1960-61 and 1969-70) may be partly attributed to the high unemployment characterizing those years. But the omission of unemployment or an explicit explanatory variable representing movements in the business cycle is not the answer for why growth appears to under-perform during the Carter-Reagan Austerity period. Taking the business cycle into account by adding a dummy variable to control for the shaded recession years depicted in Figure 1 fails to alter the conclusion that growth underperformed during the Carter-Reagan austerity period. An F test comparing the regressions with and without the recession dummy accepts the null hypothesis that the coefficients on recession and its interaction with growth are zero, actually an unsurprising result since the negative percentage growth in income already accounts for recession years. Moreover, during the Carter-Reagan austerity period the economy also under performed during expansionary years. Other factors were at work. Contemporaries offered a host of possible explanations such as rising income inequality and the decline in social welfare transfers, increases in nonworking households, inflationary erosion of low earners wages, and a post-1970s weakening of growth's prowess at reducing poverty.

Disentangling the effects of many factors to assess conflicting policy positions of advocates for growth versus redistribution entails testing several direct questions and counterfactual conditionals concerning the relative effects of growth and inequality on poverty. Did the pure growth effect on poverty decline after the late 1970s? Had social welfare transfer policies remained at pre-1977 levels, would growth have reduced poverty more during the Carter-Reagan era of austerity? Would poverty have fallen substantially more after the mid-seventies had behavioral choices such as labor force participation and the living arrangements of parents remained at sixties levels? More generally, given constant inequality would growth have reduced poverty as effectively during the eighties as the sixties?

Summary of General Findings and Conclusions:

1. *Overwhelming importance of macroeconomic performance*: economic growth (measured by annual changes in mean family or household income), and inequality (measured by annual changes in the gini coefficient of family or household income) explain approximately 75% of the variation in poverty changes over the four decades; unintentional and intentional changes in poverty measurement due to Census Bureau processing changes explain another 17%.

    a. The pure growth effect on poverty shows no evidence of having changed over time -- (inequality constant) income growth's effectiveness at reducing poverty remained constant.

    b. However, rising income inequality raised the growth rate needed to sustain a given reduction in poverty; reaching a decadal apex during 1980s, poverty reduction of .25 points required average growth of 2.07% versus the 1960s when growth of 1.35% diminished poverty .25 points.

    c. Poverty rates were artificially high during Carter-Reagan austerity and artificially low during the 1960s. Changes in Census Bureau measurement procedures altered the observed time path of poverty rates from a path consistent with a constant real income poverty line.

    d. Adjusting the timeline of poverty rates to account for unintended increases in poverty thresholds due to overestimated inflation and census processing changes still leads to the conclusion income growth underperformed reducing poverty during the 1980s; however 1980s growth underperformed less than is suggested by the published CPS data.

    e. The hypothesis that inflation raises poverty by redistributing income against the poor is rejected. High inflation artificially biased poverty statistics upwards due to mismeasured poverty thresholds not an inflation tax on the poor.

2. Rising earnings inequality drove the slowdown in poverty reduction, and federal cash income transfers contributed significantly to poverty reduction. Changes in the proportion of female householders (or proportion of children in such households) had no statistically discernable effects on changes in poverty. However, changes in the proportion of households unattached to the labor market exerted a statistically discernable effect on changes in the poverty rate largely offsetting the decline in poverty attributed to increased social welfare transfers.

    a. Had there been no increases in earnings inequality, by the end of the century income growth would have driven the poverty rate close to 5%, less than one-half its actual rate.

    b. Had the Carter and Reagan Administrations (C-R)increased redistributive transfers at the average rate of predecessors (1959-1976), poverty would have been 6.29% instead of 11.9%. Had all subsequent administrations followed Gerald Ford's 1976 growth of transfers, the poverty rate of 1999 would have reached 9.67%.

c. Had there had been no increases in the proportion of zero earning families the poverty rate at the end of 1999 would have been about 8.7%.

3. A Brief History of the Econometric Problem[2]

Pursuing a quantitative analysis of the issues requires reliable estimates of the quantitative effects on poverty of income growth and inequality. Yet, review of a vast literature reveals a lack of consensus concerning the relative quantitative importance to poverty reduction of economic growth versus a host of secondary factors presumed to determine inequality. During the 1960s, heightened public awareness of poverty influenced U.S. political institutions to generate a considerable governmental apparatus to define, measure, and attack the poverty problem. Early on during this period, economists constructed analytical methods designed to produce statistical estimates of the macroeconomic determinants of poverty. The favored method (Aaron, 1967; Anderson, 1964; Galloway, 1965) assessed the poverty reducing effects of economic growth and the business-cycle by estimating an OLS time-series equation such as[3]

$$Log P = \alpha + \beta_1 Log \hat{y} + \beta_2 Log u + \varepsilon ,$$

where P, $\hat{y}$, and u are measures of the annual poverty rate, aggregate income, and unemployment rate.

Estimates of variants of this equation seemed to perform well during the sixties. Regression of the equation between 1959 and 1970 yields an R^2 of .99, an F statistic of 590, and apparently impressive estimated coefficients for the explanatory variables. Both coefficients are statistically significant at the one percent level and have the expected signs (-1.69 for mean family income and .18 for unemployment). The strong relationship between poverty and the predictors, a respectable Durbin-Watson statistic of

[2] This summary addresses an established research paradigm investigating empirical relationships between macroeconomic performance and poverty (Aaron, 1967; Blank and Blinder, 1986; Blank, 1993; Cutler and Katz, 1991, Galloway, 1965; Haveman and Schwabish 1998; Thornton et al, 1978; Powers, 1995, Tobin, 1994). It is important to distinguish that research paradigm from a related literature of more recent vintage that attempts to explain the causal processes underlying significant change in measures of inequality beginning during the late 20th century (Borhas and Ramey, 1994; Levy and Murnane, 1992; Parker, 1998-99; Jantii, 1994; Juhn et al, 1993; Mocan, 1999). The latter papers attempt to explain why inequality increased. This paper does not, it provides a macroeconomic history of poverty taking the time paths of income and inequality as givens to investigate relationships between the macrodistribution of income and poverty.

[3] The Census Bureau did not publish time series on the poverty population until December, 1967. Therefore, the earliest studies used a commonly accepted income standard ($3000 in inflation-constant-dollars) and defined the poverty population as the proportion of families below the standard.

1.68, and the impressive estimated income elasticity of poverty, probably explains why analysts initially neglected the strong correlation between the two explanatory variables, -.799, and the hint of specification bias in a plot of residuals against predicted values. The regression relationship soon broke down; re-estimating the equation from 1959–2001 yields an R^2 of .496, an F of 19.66, and a statistically insignificant coefficient for u. Moreover, a DW statistic of only .07 and tiny characteristic roots for predictors indicates a serious problem of autocorrelation that is confirmed by a residual plot strongly suggesting some important explanatory variable has been omitted. Below it is shown that the omitted variable is a better measure of inequality required to capture its important effects on poverty.

During the seventies, variants of the early econometric specification performed poorly against the supply-side shocks to the economy and a slowdown in growth accompanied by rising poverty. Influenced by social commentators asserting the growing economy should be sufficient to decrease poverty, after 1980, many policy analysts' downgraded macroeconomic performance to emphasize demographic indicators of social behaviors such as peoples' living arrangements and policy variables such as the size of government income transfers. Researchers augmented the original specification of the relationship between poverty and macroeconomic performance with explanatory variables that typically included measures of the level of government income transfers, the proportion of families with female householders, inflation, and the changing racial composition of the population. Such an equation or similar specifications were used to develop estimates of the relative quantitative importance of various economic and demographic variables in reducing or increasing poverty over time **(**Blank and Blinder, 1986; Blank, 1993**,** 2000**;** Cutler and Katz, 1991; Haveman and Schwabish, 1998**;** Thornton et al., 1978**)**. Several problems with the augmented regression equation were soon apparent. The most important practical problem was wide divergence of different analysts' estimates of key regression coefficients rendering firm conclusions about the relative importance of explanatory variables unattainable. Critiques of the model pointed to intractable problems in the time-series arguing collinearity and nonstationary features of the underlying variables created large standard errors for estimated coefficients rendering the estimates unstable and unreliable (Danziger and Gottschalk, 1986, 1985; Parker, 2000).[4]

Second generation approaches to estimating the quantitative determinants of inequality and poverty have taken two approaches. Similar to the oldest vintage models, the first regresses distributional

[4] Blank (2000), regressing the poverty rate on such explanatory variables, commented on the untenable finding that decreases in unemployment during the 1980s appeared to raise poverty.

summary statistics such as poverty or inequality indices on demographic and social indicators. However, recognizing that both the dependent and explanatory variables may be nonstationary, practitioners take into account time series properties of the data examining it for unit roots and cointegration of series that may render OLS estimates invalid. Parker (2000) has discussed seemingly insurmountable problems with this approach, and Jantti and Jenkins (2001) have shown that papers using the framework of dynamic econometrics have ignored the fact that inequality indices (such as a poverty index) are generally bounded by one so their variances must be finite. This seriously undermines frequent findings that the time-series have unit roots and unbounded variances.

This paper draws upon the insights contained in another line of second generation research that recognizes previous work in this area did not fully exploit the conceptual point that a poverty rate is determined by an underlying distribution of income and therefore by the location and dispersion of society's income distribution; the only variables that can *directly* affect poverty are the distribution's moments (e.g. its mean, variance, and possibly higher order moments). Other variables affecting poverty must do so *indirectly* by affecting the moments. This research estimates the determinants of poverty (inequality) in two steps. First, choose a specific parametric function for the distribution of income (e.g. displaced lognormal (Gottschalk and Danziger, 1985); Sing-Maddala distribution (Jantti and Jenkins, 2001). The poverty rate is defined by the chosen distribution and its underlying parameters; therefore, for each year, compute from cross-sectional data estimates of the parameters (e.g. mean, variance) of the chosen distribution function. The computed parameter estimates are then regressed on a set of explanatory demographic and social variables. The result is a time series of the chosen income distribution's parameters as functions of the demographic and social variables. The right hand side of the fitted parameters may then be substituted into the distribution function (simulating moments) to estimate poverty for a given year (as a function of the social and demographic variables). Varying years the effects of changes in the demographic and social variables on poverty or inequality can be assessed.

Similar to those authors, I estimate the determinants of poverty in two steps. However, by exploiting alternative properties of parametric distribution functions, I use an estimation procedure designed to investigate issues relevant to the economic historian. Specifically, the method produces an estimate of the independent effects of income growth and "inequality" on the poverty rate while separating those effects from the important but previously neglected effects of Census Bureau measurement changes which are found to have assumed a significant role in the determination of

historical poverty rates. The effects of Census Bureau measurement changes are a key component to answering the question why were poverty rates so high during the 1980s.

Recognizing that the poverty rate is a functional of a distribution of income function leads naturally to the mathematical result that annual changes in poverty imply a regression relationship based on first differences of the poverty rate and the parameters of the underlying income distribution function. Starting from this observation, and with no need to assume a specific functional form for the parametric income distribution, I estimate the effects of changes in various explanatory variables on changes in poverty by estimating OLS coefficients for two equations in a recursive system; equation one regresses poverty change on changes in mean income, inequality, and census measurement changes; equation two regresses changes in inequality on changes in social and demographic variables. Because variables appear as first differences, the method avoids problems concerned with I(1) time-series and attenuates collinearity problems considerably reducing standard errors and providing more stable estimates of variable effects. Moreover, the specification design affords additional benefits such as estimation of the effect of inequality per se (as measured by indices such as the gini) on growth's poverty reduction efficiency, and leads naturally to an estimate of the effects on poverty of changes in the definition and measure of poverty due to changes in the Census Bureau's procedures for generating the data. Importantly, the model leads to a natural method of simulating the time path of the poverty rate under alternative counterfactual assumptions.

4. Methodological Framework

A society's poverty rate and changes in that rate are determined by its definition of poverty and the society's underlying distribution of income. By the definition of poverty I refer to income thresholds used to determine an individual's poverty status, the types of resources counted as income in the determination of poverty status, and the methods used to measure income. Given the types of resources counted as income and the methods used to measure them, during any year, a person is said to be in poverty if he lives in a household with income $y < y^p$ where y^p is the appropriate poverty threshold, i.e. the income below which a household is deemed to be in poverty. [5] To minimize notational complexity I work with one poverty threshold. The distribution of income f(.) is assumed to be parameterized by mean income $\hat{y}$ and k parameters of dispersion g_i. Thus, the proportion of the population classified

[5] Throughout most of the paper I use family and mean family income rather than household counterparts because the time series on family data begins with 1948, while household data starts in 1967. Estimation differences are discussed below. The U.S. Census Bureau defines a family as two or more persons living together and related by birth, marriage, or adoption.

poor (P) is a function of the parameters of the income distribution and an m vector of shift parameters μ which represent the definitions of income and poverty. In the simplest case μ is a scalar equal to the poverty threshold y^P and clearly changes in μ change measured poverty (see the appendix):

$$1. \qquad P = \int_a^{y^p} f(y, \hat{y}, g_{1,}...g_k)dy = P(\hat{y}, g_1...g_k, \mu).$$

These factors determine year-to-year changes in poverty. Totally differentiating P decomposes the change in poverty into its constituent parts:

$$2. \qquad dP = \frac{\partial P}{\partial \hat{y}} d\hat{y} + \sum_i \frac{\partial P}{\partial g_i} dg_i + \sum_j \frac{\partial P}{\partial \mu_j} d\mu_j.$$

Substituting finite changes in these quantities for their continuous counterparts in equation 2 provides an excellent candidate for OLS estimation of the partial derivatives (e.g. the effects of changes in explanatory variables such as mean income). However, in addition to being unknown, the explanatory variables dg_i in equation two present an index problem. Referring to the terms within the first summation sign allow statements such as the coefficient on dg_i (change in the ith parameter of dispersion) is equal to that parameter's partial effect on changes in poverty holding constant all other parameters of dispersion as well as mean income and the poverty definition. Although this would be a technically correct statement, it would generally not be very meaningful in an economic or policy sense. What is desired is the ability to make statements such as a coefficient represents the partial effect of "inequality" change on change in poverty holding constant mean income and the poverty definition. To do this requires an index of inequality, and an ideal index would equal a linear combination of the dg_i. Let g equal the income gini for the income distribution represented in equation 1. Then $g = G(\hat{y}, g_{1,}...g_k)$ is a function of the mean income and parameters of dispersion. In the appendix it is shown that $dg = \sum_i \frac{\partial G}{\partial g_i} dg_i$ making dg a linear combination of the dg_i and therefore a perfect index and proxy for the summed changes in the unknown parameters of dispersion.[6] Let Δg equal year-to-year changes in the gini, I estimate equation

[6] For a heuristic demonstration, write: $g = G(\hat{y}, g_{1,}...g_k)$ with $dg = \frac{\partial G}{\partial \hat{y}} d\hat{y} + \sum_i \frac{\partial G}{\partial g_i} dg_i$. Observe $\frac{\partial G}{\partial \hat{y}}$ is the pure mean effect, the independent effect of a change in mean income on the gini or, equivalently, the change in inequality due to a change in mean income (holding constant the parameters of dispersion). It follows that

$$3.\quad \Delta P = \beta_{\hat{y}}\Delta\hat{y} + \beta_g \Delta g + \sum_j \beta_{\mu_j}\Delta\mu_j + \varepsilon\ .^{7}$$

Interpret Δg as a weighted index of changes in the parameters of dispersion underlying the distribution of income. The index weight of each dispersion parameter is equal to its independent effect on change in inequality as measured by the gini. Thus, change in the gini is a superb index for the combined effects of the parameters. Moreover, estimating equation 3 with changes in the gini as an explanatory variable provides foundation to intuitively appealing statements such as β_g in equation 3 represents an estimate of the change in poverty due to a change in "inequality" holding mean income and the poverty definition constant. One can well argue that use of an index of inequality such as the gini is more satisfactory than estimating the individual parameters (if they were known). Inferences about the effect of a change in inequality that refer to a composite index such as the gini are more useful and intelligible than inferences based on changes in individual parameters of dispersion would be.

The complete system of regression equations augments equation 3 with 3a and 3b:

$$3a.\quad \Delta g = \beta_1 \bullet \Delta X_1 + \varepsilon_1$$

$$3b.\quad \Delta\hat{y} = \beta_2 \bullet \Delta X_2 + \varepsilon_2$$

The β_i *and* X_i are vector valued exogenous explanatory variables and corresponding coefficients to be estimated. I make no attempt to estimate the complex macroeconomic system implied in 3b. The paper focuses on the relationships in 3 and 3a assuming that the error term satisfies the usual OLS conditions, an assumption interrogated in the appendices.

$\frac{\partial G}{\partial \hat{y}} = 0$; with a relative or mean independent measure of inequality such as the gini a change in mean income that leaves the parameters of dispersion constant is equivalent to an equiproportionate increase in all incomes, i.e. a shift in the location of the distribution that leaves its shape and therefore the gini constant (Sen, 1997), see appendix. This mean independence of the gini implies that dg is a linear combination of the dg_i with $dg = \sum_i \frac{\partial G}{\partial g_i} dg_i$.

[7] The attempt to estimate equation 1 by regressing the poverty rate on mean family income and the family income gini is encumbered by intractable collinearity problems. Estimating the equation $P = \beta_1\hat{y} + \beta_2 g + e$ for 1959-2001 yields an R^2 of .944, an F statistic of 336, and coefficients statistically significant at the one percent level and with the expected signs (-.00055 for mean income and 146.8 for the gini). However, the correlation between the two explanatory variables is .850 and characteristic roots are small (.00095 and .020). Graphing the residuals against predicted values indicates serious autocorrelation that is confirmed by a Durbin-Watson statistic of only .836.

Next note the poverty thresholds and other factors determining the measurement and definition of poverty in equation 3 do not change every year; in fact, most years the vector $\Delta\mu = 0$. As a consequence $\Delta\mu$ is modeled as a vector of binary categorical variables. The appendix discusses the motivation (history of Census Bureau revisions to the poverty thresholds) and determination of these categorical variables in detail. Here I report that based on the history of Census Bureau revisions, I estimated three categorical variables (μ_y, μ_g, and μ_I), the first two based on revisions of poverty thresholds and the definition of income and a third based on revisions in inflation methodologies used to adjust nominal poverty thresholds to time constant real values; in principle and practice a change in the inflation method is equivalent to a revision in the poverty thresholds.

To decompose the effects of relevant explanatory variables on changes in poverty since 1959, I follow a three-step procedure: first, estimate the direct effects of economic growth, (e.g. changes in mean family income), inequality (e.g. changes in the gini coefficient on family income), and changes in the poverty definition on poverty via equation 3. Second, estimate the indirect effects of changes in second order explanatory variables on income inequality via equation 3a. Effects on poverty of the indirect variables are then estimated as the multiplied effect of the coefficients estimated from the two equations.

This specification of the problem immediately suggests several questions.

- Did the rate of change of poverty with respect to economic growth decline over time (i.e. was $\beta_{\hat{y}}$ smaller after the late 1970s)?

- How much did rising inequality reduce the responsiveness of poverty to income growth (i.e. what increase in growth rates was required to maintain a given reduction in poverty)?

- If the proportions of female householders and families absent an earner had grown less, would the poverty response to income growth have been more stable?

- Absent the slowdown in the growth of social welfare transfers during 1977–1989 would the reduced inequality have made a difference in poverty's response to income growth?

5. Estimating the Model

I tested two hypotheses concerning inflation's possible effects on the poverty rate. One hypothesis is that mismeasured inflation biased poverty thresholds upwards and incorrectly increased Census

measured poverty rates. I test for this kind of unintentional increase in poverty thresholds by coding a categorical explanatory variable $\Delta\mu_I$ equal to 1 in any year the rate of inflation exceeded 6 percent (one s.d. above the 4% mean inflation rate for 1960-2001) and zero otherwise. All of the years coded 1 occur during the period 1974-1982 a period about which economists generally agree that the CPI overestimated inflation because of its treatment of residential housing. I hypothesize upward adjustments in the nominal poverty thresholds were too high unintentionally raising real poverty thresholds and incorrectly increasing the poverty rate during these years. An alternative hypothesis is that inflation redistributes income against lower income families (see Blank and Blinder, 1986 for a critique of this hypothesis), and thus, increases poverty. I test this hypothesis against the first by including the annual inflation rate as an explanatory variable in equation 3.

The sign of $\Delta\mu_I$'s coefficient should be positive. If inflation (as measured by the CPI-U-RS) was overestimated, the poverty thresholds would be adjusted too high throwing additional households into poverty. In contrast, $\Delta\mu_y$ is a categorical variable coded 1 for years during which a CPS processing change either changed poverty thresholds directly or did so indirectly by altering the definition and measurement of incomes *throughout* the income distribution. The sign of $\Delta\mu_Y$'s coefficient should be negative because CPS processing changes generally increased measured incomes effectively lowering poverty thresholds. Finally, $\Delta\mu_g$ is coded 1 during years when a CPS processing change affected the definition and measurement of incomes above the highest quintile of the income distribution but not below. The sign of the coefficient on $\Delta\mu_g$ is ambiguous. On the one hand, a processing change that affects only families in the higher quintiles of the income distribution will have no direct effect on the measured rate of poverty. Alternatively, such a processing change could have significant effects on measured mean income and inequality creating a break in the relationship between poverty and income and inequality. Whether the disruption in the time series influences the estimated equation positively or negatively would depend on the relative affects of the changes in mean income and inequality. [8]

Table 1a displays the results of regressing equation 3 with annual changes in the proportions of persons in poverty as dependent variable. Consistent with the theoretical model in equations 3 and 3a, I was unable to reject the hypothesis the intercept term is zero. Moreover, the standard error of the

[8] During 1983 and afterwards, all poverty thresholds were converted to being based on the **CPI-U-RS**. The base year (1977) for the Bureau's recalculation of currently published poverty rates based on the CPI-U is coded 0. The years coded 1 for inflation adjustments are: 1974-1976, 1978-1982, since 1979 fell in the middle of these years it was included; the years coded 1 for census changes affecting income throughout the income distribution are: 1961, 1963 (base year), 1965-1967, 1974, 1976; years coded 1 for census changes affecting the gini or income above highest quintile are: 1975, 1979, 1981, 1985, 1987, 1993. See appendix.

estimate was lower for regression through the origin and differences in estimated coefficients were generally trivial; supported by theory and the data, I focus on estimates obtained by regression through the origin throughout the paper.[9] The categorical variable μ_g failed an F test and its coefficient was not statistically significant so it was dropped from the regression. Jointly, annual changes in mean family income, the gini coefficient on family income, and the underlying definitions of poverty and inflation adjustment explain about 92% of the variation in changes in poverty during the period 1959-2001. Moreover, all estimated coefficients have the anticipated signs, are statistically significant at the 1% level, and imply changes in family income and inequality exert quantitatively large effects on poverty, see discussion below.

Boosting the explanatory power of the model considerably, the estimated effects of the categorical variables are highly consistent with equation three's prediction that Census Bureau changes in the definition of poverty were an important source of change in the published time series of poverty data. Regressing changes in poverty on changes in mean income and inequality alone (not shown) explains 70 percent of the year-to-year variations in the published poverty rate of persons, whereas the OLS estimate of equation 3 explains approximately 92 percent implying that the categorical variables account for approximately three-fourths of the original unexplained variation. Moreover, the estimated coefficients on income and inequality remain highly significant and extremely close to the coefficients obtained from the estimation of equation 3 without the categorical variables.

The overwhelming quantitative importance of economic growth is indicated by the relatively large coefficient on changes in income. An increase in mean family income of $1000, about the yearly median of $1016, on average decreased the poverty rate by about four-tenths of a point. If inequality had held steady after 1960, the $35,886 growth in constant dollar mean family income achieved by 2001 would have decreased poverty about 13.96 points drawing the base year poverty rate of 22.2 percent down to about 8.24 percent. However, inequality increased appreciably with the gini rising .071 points from .364 to .435. The increase in inequality retarded the reduction in poverty due to income growth by about 3.95 points. The net effect of income growth and inequality was a decrease of the poverty rate to about 12.19 percent. The combined effect of inflationary increases and income definition decreases in poverty thresholds is estimated to have lowered poverty an additional 1.16 points for an estimated 2001

[9] Of course, the R^2 for regression with and without an intercept are not comparable; standard errors of the estimates which are comparable, suggest regression through the origin provides a better fit with the data.

poverty rate of 11.03. Since the poverty rate for 2001 published in official census data is 11.7, we have another .67 point or 6 percent due to unexplained error in the regression.

Based on the theory behind the model, demographic and policy variables usually included as explanatory variables in related literature were omitted from equation 3. To verify the model specification, I added change in demographic variables such as unemployment, the percentage of families with female householders, the percentage of families with zero earners, and social welfare transfer payments to the original regression. Whether added individually or in various combinations, none of these variables added explanatory power to the model, and none possessed statistically discernable coefficients. Moreover, the estimated coefficients on changes in mean family income and the family income gini remain remarkably stable throughout the additions of these variables (see appendix). I conclude, *once changes in mean income and income inequality have been controlled for, the other demographic variables had no effects on changes in the rate of poverty.*

TABLE 1a: Regression of Change in Poverty on Changes in Mean Income, Inequality, and Census Measurement Changes

ΔP persons	Intercept	**Coeff** $\Delta\hat{y}$	**Coeff Δg**	**Coeff** $\Delta\mu_y$	**Coeff** $\Delta\mu_I$
	0	**-.000389****	**55.71****	-.863**	.610**
s.e.	N.A.	.0000256	5.75	.091	.083
Adjusted R^2 .924	F	DW	Standard Error	Min eigenvalue	N
	129.02**	2.29	.223	.573	42

TABLE 1b:

Regression of Change in Income Gini On Changes In Social And Demographic Variables

Δg	Intercept	**Coeff Δg_e**	**Coeff $\Delta 0E$**	**Coeff ΔTr**	**Coeff ΔFhh**	**Coeff Δu**
	.00072	**.722****	**.478****	**-.0000122***		
s.e.	.001	.060	.131	.0000052		
R^2 .818	DW 1.72	F 56.80	Min eigen .293	N 42		
Model 2	.00111	**.706****	**.298**	**-.0000142***	**.0085**	**.00101**
s.e.	.001	.061	.168	.0000055	**.095**	.001
R^2 .831	DW 1.75	**F** 35.46	Min eigen .218	N 42		

*Significant at 5 percent level. ** Significant at 1 percent level.

Inflation and Poverty

To examine the two alternative hypotheses about the affect of inflation on poverty, I considered alternative specifications of the inflation variable in equation 3. Substituting the continuous variable, annual rate of inflation measured by the CPI-U-RS, for each of all 42 years for the inflation categorical variable produced results similar to the original regression of equation 3. Eighty-nine percent of the variation in the poverty rate was explained, all estimated coefficients were statistically significant at the one percent level (except again μ_g), and the coefficients on income and inequality changes exhibited considerable stability, measuring -.000437 for mean income changes and 52.52 for the gini. The statistically significant coefficient on the continuous inflation variable was 5.01 suggesting that a one percent increase in inflation increased poverty by about 5 percent on average. These results could easily lead a researcher to conclude that inflation does indeed have a significant positive effect on the poverty rate, and therefore exerts adverse distributional effects. This conclusion would be incorrect.

Considering goodness of fit measures, the estimation of equation 3 with the categorical inflation variable is a better model suggesting the regression results with the continuous inflation variable may merely be picking up Census Bureau over adjustment of poverty thresholds during the eight years of high inflation coded 1 in the categorical variable. Further investigation produces strong evidence that this is indeed the case. Re-estimating equation 3 with the continuous inflation variable but after removing the data points for the 8 years coded one in the categorical variable leads to the inflation

coefficient becoming statistically insignificant and halved in size; suggesting the 8 categorical years were doing all the work. Moreover, an F test with the restricted model containing only the categorical inflation variable and the unrestricted model containing both the categorical and continuous variables confirmed the hypothesis that the continuous variable adds no explanatory power to the model. I conclude that the affect of inflation on changes in poverty are restricted to the high inflation period 1974-1982, and that those effects were due to over adjustment of the poverty thresholds unintentionally raising measured poverty rates.

Indirect Effects Through Income Inequality

Table 1b displays the results from estimating the indirect effects of secondary social and economic demographic variables on poverty. Using equation 3a, Δg was regressed on changes in the combined gini for men's and women's earnings (Δg_e),[10] government cash social welfare transfers per household (ΔTr), the proportion of families with no earners ($\Delta 0E$), the unemployment rate Δu, and the proportion of families with female householders (ΔFhh).

Examining all combinations of the explanatory variables, changes in the proportion of families with a female householder (or proportion of children living within such families, results not shown) and changes in unemployment failed to exhibit a significant relationship to changes in family income inequality after controlling for earnings inequality, cash transfers, and households unattached to the labor market; see columns 6-7 for model 2 in Table 1b. This is predictable on theoretical grounds. Any influence of unemployment on income inequality should already be controlled for by including earnings inequality. Moreover, a similar conclusion may be made about female headed households. Such families per se do not "cause" poverty, but they are positively correlated with both low earnings and zero earnings families which do increase income inequality and are already controlled for in equation 3a. The size of the coefficient of $\Delta 0E$ and its significance exhibited sensitivity to the presence of Δu, an unsurprising finding given the correlation between the two, .636, see model 2 Table 1b. I discuss this relationship in the appendix during an examination of the robustness of the regressions. I was unable to reject the hypothesis that the intercept term of equation 3a equals zero. From here on all references to Table 1b refer to model 1 in rows 1-3.

[10] Earnings ginis are only available from 1967. The years 1959-1966 were extrapolated from a regression on the family income gini, $\hat{g}_e = .006 + .9 * g_F; R^2 = .944$. The constructed time series of Δg_e (1960-2001) has a correlation with the family gini of .86 whereas the (1967-2001) correlation with the actual earnings gini is .85. The estimated coefficient on Δg_e for the 1960–2001 period is .722 compared to .703 for the 1967-2001 period.

As expected, changes in earnings inequality were the driving force determining income inequality. Change in earnings inequality explains nearly three-quarters of the annual change in income inequality among families during the period. Changes in the size of social welfare cash transfers and the proportion of families with no earners exerted smaller effects on family income inequality. The effects of these latter two variables on inequality and poverty are discussed now.

Decomposition of Demographic Effects on Poverty

The poverty rate declined slightly more than 47 percent from a base of 22.2 percent during 1960 to 11.7 percent during 2001. I estimate that economic growth fueling increases in mean family income accounted for a 63 percent reduction in the poverty rate, while rising income inequality increased poverty by approximately 18 percent. In total, estimates of the effects of economic growth and inequality imply a 45 percent reduction in the rate of poverty; the actual reduction was 47.29 percent. How much did changes in various demographic variables reduce or increase poverty, and what were their relative contributions to the reduction in poverty during the four decades? Table 2 exhibits estimates of the explanatory variables' effects on poverty. The calculation of effects for the variables with direct effects is straightforward. However, change in earnings inequality, change in percentage of households with no earners, and the policy variable change in mean cash welfare transfers affect poverty indirectly through their effects on income inequality. Consequently, their effects on changes in poverty are determined by successively multiplying the change in each respective variable by its coefficient in the income gini regression (row 2, Table 1b) then multiplying the resulting product by the coefficient on the income gini from the poverty regression (row 2, column 4, Table 1a), see parentheses in the first column of Table 2.

TABLE 2: Estimated Effects of Explanatory Variables on Poverty: 1960-2001

	Point Change	Percentage Change
% persons in Poverty	-10.50	-47.29%
Change due to $\hat{y}$ ($-.000389 * \Delta\hat{y}$)	-13.96	-62.88%
Change due to g ($55.7 * \Delta g$)	3.95	17.79%
Change due to μ_y ($7 * -.863$)	-6.04	- 27.20%
Change due to μ_I ($8 * .610$)	4.88	21.98%
Change Explained	**-11.17**	**50.31%**
Change due to g_E ($.722 * \Delta g_e * 55.71$)	3.02	13.60%
Change due to 0Ernrs ($.478 * \Delta 0Ernr * 55.7$)	1.38	6.21%
Change due to Tr ($-.0000122 * \Delta Tr * 55.7$)	-2.02	- 9.1%

6. Policy Simulations: Alternative Policy Regimes and the Rate of Poverty

One well known answer to the question why were poverty rates so high during the 1980s (Blank, 1991) concludes the relatively low response of poverty to income growth was due to falling real wages, and that change in low-income people's family composition and work effort, problems with the measure of poverty, and changes in income transfer policies had insignificant effects. The findings reported here substantiate her first two conclusions but not the latter three. The measurement of poverty, changes in social income transfers, and work effort (consistent with declining wages) contributed significantly to poverty's weak response to income growth during the late seventies and throughout the 1980s. Particularly, social income transfer policies were important because rising inequality's erosion of growth's poverty effects was especially severe after 1970.

To begin, recall that the regression results from equation 3 (see Table 1a column 6) have already led to the conclusion that poverty rates were artificially high during the years of Carter-Reagan austerity. Unintentional increases in poverty thresholds caused by overestimated inflation raised observed poverty rates beyond the levels consistent with the original definition of an absolute poverty line constant in real income. However, adjusting the timeline of poverty rates to account for unintended increases in

poverty thresholds due to overestimated inflation (or adjusting for both inflation and census processing changes) still appears to lead to the conclusion that, although growth underperformed less than is suggested by the published CPS data, income growth still underperformed in reducing poverty during the 1980s. Regressing the percentage change in poverty on the percentage change in income growth using the adjusted data reveals that growth over performed during four years of the 1980s as opposed to just two years with the unadjusted data, see earlier discussion about Figure 3. The noteworthy under performance of income growth in reducing poverty during the 1980s remains to be explained.

Importantly, and despite seemingly persuasive arguments to the contrary (Danziger and Gottschalk, 1986; Haveman and Swabish; Cutler and Katz; Blank, 1993; Powers), poverty's weaker response to income growth during the 1980s was not due to a weaker pure growth effect. The pure growth effect on poverty (the coefficient $\beta_{\hat{y}}$ estimated in equation 3) appears not to have changed over time. An F test ($\alpha = 5\%$) applied to the regression of equation 3 (the restricted model) and a full model also containing dummy variables for time and interactions between time and the continuous variables rejects the hypothesis that $\beta_{\hat{y}}$ differed during 1960-1979 and 1980-2001.[11] More accurately, rising inequality placed considerable headwind in a constant pure growth effect's path.

The latter point is quantified by examining the shift in the efficiency with which income growth was able to reduce poverty in the face of rising inequality. During the 20th centuries' final four decades, the mean annual change in the income gini was approximately .002; after 1980 it was .003 significantly raising the difficulty of achieving reductions in the poverty rate despite an unchanging pure growth effect on poverty. Of all four decades following 1960, gini measured inequality increased the most between 1980 and 1989 suggesting that lowering poverty during the 1980s required a higher rate of growth than did any other decade. I now examine this question systematically.

The mean annual change in poverty during 1959-1999 was -.25. Using the estimated equation 3, I calculated the rate of growth required to reduce poverty annually by -.25 for each decade, see Table 3. The information in this table shows the economy of the 1980s required the highest level of income growth of all the decades. There is in particular, a sharp contrast between the tradeoff between growth

[11] An F test also rejects the hypothesis that β_g differed during these periods. The hypothesis for the latter coefficient is accepted at the 10 percent level.

and inequality comparing the 1980s and the 1960s. The mean change in inequality was negative during the sixties, therefore mean income could actually decline by about 2.13% and the sixties' economy would have still seen, on average, an annual .25 point reduction in the poverty rate! In contrast, during the eighties, on average, to achieve a quarter point reduction in the poverty rate, mean income would have had to have grown by about 2.81 percent annually. the numbers reported in the second column of Table 3 include the full effects of growth, inequality, and census measurement changes. Correcting for the latter, i.e. if there had been no changes in Census Bureau measurement of income and no errors in the measure of inflation, growth's poverty reduction prowess would have been less effective during the sixties and more effective during the eighties. Even so, correcting for the effects of measurement changes and errors, the 1980s and 1970s continue to standout requiring significantly higher rates of income growth to achieve moderate reductions in poverty (compare columns 2 and 3 Table 3) .

TABLE 3: Average Growth Rate Required to Reduce Poverty by its Average Change

	$\frac{\hat{\Delta}y_i}{\hat{y}_i} = \frac{\hat{\Delta}P - \beta_g \hat{\Delta}g_i - \beta_{\mu_y}\hat{\mu}_{y_i} - \beta_{\mu_I}\hat{\mu}_{I_i}}{\beta_y \hat{y}_i}$		$\hat{\Delta}g_i$	$\hat{y}_i$	$\hat{g}_i$	$\hat{\Delta}y_i$	$\widehat{\mu_I}$	$\widehat{\mu_y}$
	Uncorrected	Corrected $\widehat{\mu_I} = \widehat{\mu_y} = 0$						
1990s	**1.64%**	**1.64%**	.0027	62841	.419	1029	0	0
1980s	**2.81%**	**2.07%**	.0036	58021	.385	1629	.30	0
1970s	**2.59%**	**1.99%**	.0024	51573	.358	1335	.50	.20
1960s	**-2.13%**	**1.35%**	-.0012	29901	.358	-638	0	.5

Required growth rate formula calculated from regression equation 3 (Table 1). Take the expectation eliminating error term, solve for variable $\hat{\Delta}y_i$ and set $\hat{\Delta}P = .25.$ Then solve for the numerical value of $\hat{\Delta}y_i$ giving the mean annual income change needed to reduce poverty annually by .25 points during decade i. Then divide the calculated $\hat{\Delta}y_i$ by the simulated mean decade income $\hat{y}_i$ (the decade's mean income assuming income increases by a constant $\hat{\Delta}y_i$ after beginning with the decade's actual initial income).[12]

[12] An alternative method is to use each decade's starting mean income and its required $\hat{\Delta}y_i$ to generate annual income growth rates and then compute the decade average. This method leads to marginally higher required growth rates (1990s -- 1.64%, 1980s -- 2.83%, 1970s -- 2.60%, 1960s -- -2.14%) but leaves the previous conclusions unchanged.

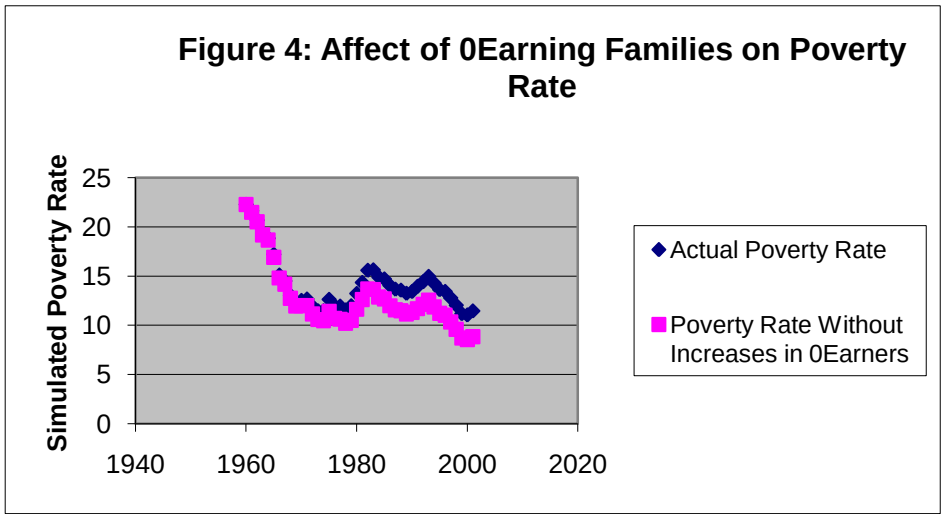
Counterfactual Simulations

What were the causes of the slowdown in poverty reduction due to increasing inequality? One argument put forward by contemporaries and maintained afterwards is that income growth was strong after 1982 and would have been adequate to reduce poverty if not for increases in the number of female householders and families unattached to the labor market. An alternative argument suggests that poverty's observed weakening response to growth was due to reductions in social income transfers. A cursory inspection of Table 2, suggests that the effects of zero earning families and income transfers appear too small to have made much of an impact. However, observe that the increase in poverty due to the rise in the percentage of families without earnings is estimated at 1.38 points, in percentage terms this is 35% of the poverty rise caused by increasing inequality. Similarly, increases in cash transfers redressed over 50% of the increase in poverty caused by rising inequality. These results show one cannot gauge the significance of a variable's effect on poverty merely by observing its absolute or sole effect. It is a variable's relative effect that matters, e.g. what would have happened to the path of the poverty rate during some time period if the variable in question had behaved differently while all other variables behaved as observed? I now present simulations designed to answer these questions.

If the proportion of female householders and families absent an earner had not grown so rapidly, would inequality have fallen enough to keep poverty's responsiveness to growth more stable? We have already seen that changes in the proportions of female householders or children in such families had no affect on income inequality or poverty after controlling for earnings inequality and households lacking an earner. In contrast, during the course of the four decades, the increase in families with weak labor force attachment (zero earners) was a significant factor in the rise of inequality and therefore in retarding reductions in the rate of poverty. Using the regressions of equations 3 and 3a to calculate simulations of the poverty rate, estimates that, if there had been no increases in the proportion of zero earner families during the last four decades of the century, the poverty rate at the end of the 20th Century would have been about 8.7%, 3.2 points less than the actual rate.

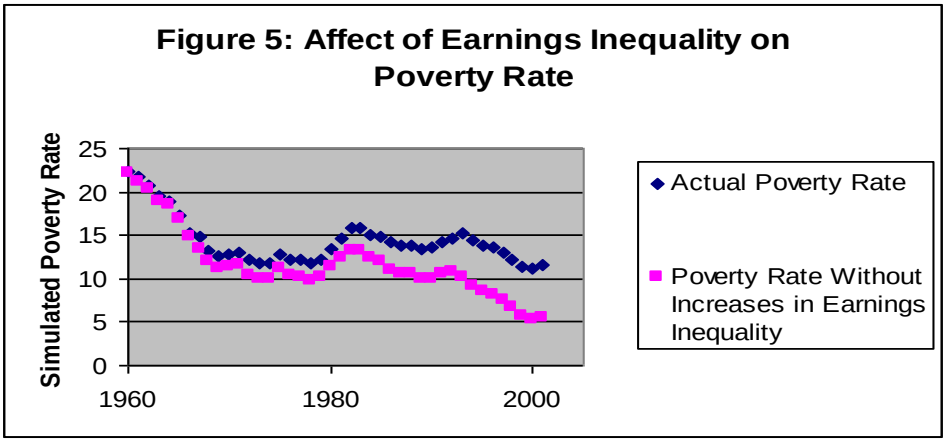
Interestingly, although declining labor force attachment proves to have been a significant contributor to the poverty rate, weakening labor force attachment was not a great factor during the 1980s when advocates of growth and stringent transfer policies were citing disintegrating families and a declining work ethic as the primary reasons why poverty rates were not falling faster. Most of the increase in poverty due to the rising proportion of families without an earner occurred during the 1970s which accounted for 60% of the four decade increase. Had there been no increases in the proportion of

families lacking an earner, the poverty rate would have declined 18.32% during the expansion between 1982 and 1989; In actuality, the poverty rate declined 14.66%. Thus, the increase in families without an earner lessened poverty decline during the expansion by about 25%. During the seventies, deteriorating attachment to the labor force weakened poverty reduction by about 74%.



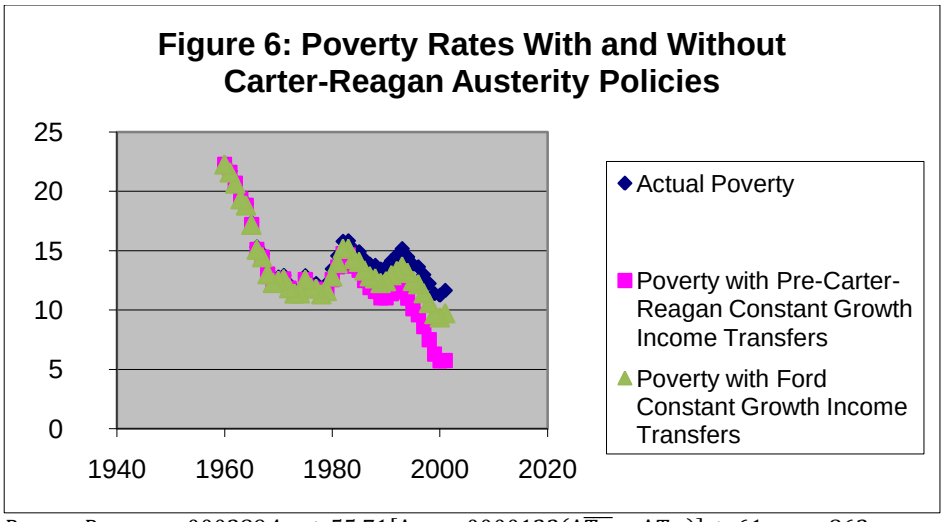
Simulated Poverty, $Pov_i = Pov_{i-1} - .000389\Delta y_i + 55.71(\Delta g_i - .478\Delta 0E_i) + .61\mu_{I_i} - .863\mu_{y_i}$ i = 1960 ... 2000. Simulation assumes no increases in zero earner families. Decreases are allowed so results not strictly comparable to Table 2.

Absent the slowdown in the growth of redistributive transfers during 1977–1989 would the resulting slowdown in inequality increases have made a significant difference in the responsiveness of poverty to income growth? Stated differently, did Carter-Reagan austerity raise the poverty rate? First note regardless of the answer to this question, rising earnings inequality was the most important factor raising income inequality and retarding reductions in poverty through economic growth. Changes in earnings inequality (real wages and unemployment) explain three-quarters of the change in income inequality among families. Had there been no increases in earnings inequality after 1959, by 1999 income growth would have driven the poverty rate close to 5%, less than one-half its actual rate, see Figure 5.



$Pov_i = Pov_{i-1} - .000389\Delta y_i + 55.71(\Delta g_i - .722\Delta g_{ei}) + .61\mu_{I_i} - .863\mu_{y_i}$ for i = 1960 ... 2000 and $\Delta g_{ei} = \Delta g_i$ if $\Delta g_i > 0$ *and* 0 *otherwise*. Simulation assumes no increases in earnings inequality. Decreases are allowed so results not strictly comparable to Table 2.

Notwithstanding the primacy of earnings inequality in retarding poverty reduction, the slowdown in redistributive transfers also had a role. Between 1960 and 1976, mean transfers per household increased at an average annual rate of 5.5% compared to seven-tenths of 1% between 1977 and 1989. Had the Carter and Reagan Administrations increased redistributive transfers at the same rate as their predecessors and this policy continued to the end of the century, the poverty path would have been significantly lowered and by 1999 the rate of poverty would have been about 6.29%. However, to reach this level of poverty mean transfers would have had to increase to nearly three times the actual amount during 1999. A more sustainable level of increase in transfers is the 2.8% increase engineered by President Ford during 1976. If mean transfers had grown 2.8% annually from 1977 on, mean transfers in 1999 would have been about 4% greater, and the poverty rate would have been 9.7% instead of 11.9%.



$Pov_i = Pov_{i-1} - .000389\Delta y_i + 55.71[\Delta g_i - .0000122(\Delta\overline{Tr_i} - \Delta Tr_i)] + .61\mu_{I_i} - .863\mu_{y_i}$.
For i ≥ 1977, $\Delta\overline{Tr_i}$ = annual change in social transfers between years i and i-1 assuming 5.5% (2.8%) constant growth of transfers, and for i ≤ 1976, $\Delta\overline{Tr_i} = \Delta Tr$i. Simulations assume constant growth of transfers so results not strictly comparable to Table 2.

APPENDIX

Proof of $\frac{\partial G}{\partial \mu}=0$.

A simple proof of the proposition is to note that scale invariance of the Gini implies it is homogeneous of degree zero with respect to the income distribution's mean.

$g = G(\mu, g_{1,} \ldots g_k) = G(\lambda\mu, g_1 \ldots g_k)$ for all $\lambda>0$, therefore, $\frac{\partial G}{\partial \mu} = \frac{\partial G}{\partial \mu}\lambda \Rightarrow \frac{\partial G}{\partial \mu}=0$.

An alternative proof makes use of one of the many representations of the gini. If F(.) is the distribution of income, $g(\mu) = \frac{2}{\mu}\text{cov}\, ariance(y, F(y))$ (Lerman and Yitzhak). A change in the mean represented by a scale change $\lambda\mu$ is equivalent to changing all incomes by λy. So, $g(\lambda\mu) = \frac{2}{\lambda\mu}\text{cov}\, ariance(\lambda y, F(\lambda y)) = \frac{2}{\lambda\mu} Co\,\text{var}\, iance(\lambda y, \lambda F(y)) = g(\mu) \Rightarrow g'(\mu) = 0$ by rule of change of variable on the function F(.) and homogeneity of degree one of covariance function.

Robustness

This section reports the results of sensitivity analyses conducted to ascertain if the econometric model is robust to substitution of alternative measures of income and inequality. It also reports on tests to determine whether some variables are endogenous in the secondary equation, and whether the gini is indeed a "good" proxy for inequality in equation 2 by conducting a 2sls analysis using Atkinson's measure of inequality as an instrument for the gini.

To test the robustness of the regression specification, equations 3 and 3a were estimated using alternative measures of poverty, income, and inequality. Switching the dependent variable from all persons to family poverty rates barely changed the estimated coefficients on changes in income and inequality. Regressing the poverty rate on changes in mean household income, the income gini for all households, and the inflation and poverty definition categorical variables explains about 88% of the variation in the rate of poverty among persons during the years 1967-2001; changes in family income

and inequality over this same time-period explain 89% of the variation.[13] Moreover, estimated coefficients are again significant at the 1% level, and the household explanatory variable's quantitative effects on each measure of poverty are well within the 95% confidence intervals for the family variables. The effect of a change in mean household income on change in the rate of poverty is -.000445, and the estimated effect on poverty of a change in the household gini coefficient is 52.44. The coefficients on the categorical variables are also quite comparable, .647 for inflation and -.714 for income and threshold changes. There are also no apparent concerns with multicollinearity among the explanatory variables in any of the regressions; the smallest characteristic roots of the correlation matrices are well above zero.

Sensitivity analysis of the census income categorical variable was done by recoding various combinations of years from 1 to 0. The results had trivial effects on the estimated coefficients for income and inequality but did lower the proportion of variance explained. The regression was most sensitive to recoding of the years 1961 and 1965-67; during these years the Census Bureau made significant changes in procedures for imputing income to respondents with missing income categories or added new income questions to its household survey (see below).

Equation 3 was also estimated using alternative measures of income inequality such as Atkinson's measure, mean logarithmic deviation of income, and the Theil index for households. These inequality indexes are available from 1968 and comparisons considered 1968 – 2001. The fitted regressions performed well. The coefficient on $\Delta\hat{y}$ remained virtually unchanged and, where units of measure were similar, the changes in the coefficient on alternative measures of inequality produced results quite comparable to those obtained with the gini index. For example, using explanatory variables change in family income and change in the Atkinson measure weighted most sensitive to income changes in the bottom income quartile produced results virtually identical to those using family income and the family gini (allowing for fact that Atkinson and gini measures are in somewhat different scales). Using the Atkinson measure, the regression explained 90% of the variation in poverty changes and produced coefficients for the explanatory variables significant at the 1% level; substituting the gini explained 89% of the variation. The respective coefficients on changes in income were -.000351 with the Atkinson measure and -.000367 with the gini; the coefficients for inequality were 46.94 (Atkinson) and 47.71 (gini); coefficients of the categorical variables barely changed.

[13] N equal 34 for estimations based on HH variables because CPS data for HH originates from 1967. Reported comparisons for family and household variables based on 1967-2001 period.

A major implication of the approach taken in this paper is the conceptual argument that social and economic demographic variables such as unemployment and female headship have no direct effect on the poverty rate beyond their indirect effects on mean income and income inequality. Earlier I confirmed this by showing that after controlling for changes in mean income and inequality, changes in unemployment, the proportion of families with female householders, the proportion of families with no earners, and mean government cash transfers have no statistically significant effect on changes in either measure of the rate of poverty. The absence of direct effects on poverty from these variables holds individually and when added to the regression equation in various combinations. Moreover, augmenting equation 3 with these variables also produces only small changes in the estimated coefficients on change in mean income and change in the gini. For example, estimating the effects of changes in family mean income and family gini on the change in poverty per person, the coefficients on $\Delta\hat{y}$ and Δg range from (-.000384 to -.000405) and (54.31 to 56.32) respectively when these additional (insignificant) explanatory variables are included in various combinations, and the categorical coefficients hardly change at all.

As reported earlier, changes in unemployment and the proportion of female householders also had no significant effects on family income inequality after controlling for changes in earnings inequality, cash transfers, and the proportion of families with no earner. However, the correlation between Δ0earners and Δu is quite high. Consequently, adding change in unemployment to the regression reduces the coefficient on Δ0E 37% and it becomes statistically insignificant. This suggests the possibility that although Δu's main influence on income inequality is through earnings and is therefore controlled for in equation 3a through the earnings gini, changes in unemployment may still affect income inequality through a possible influence on Δ0earners. The latter explanatory variable may be endogenous in equation 3a. To investigate this further, equation 3a was estimated using 2sls.

Treating changes in the earnings gini and ΔTr as exogenous with Δ0earners as endogenous in equation 3a, Δu became an instrument for Δ0earners. The 2sls regression of equation 3a produced virtually no change in the coefficient on earnings inequality and increases in the coefficient on ΔTr were very modest. However, the coefficient of Δ0earners rose from an OLS estimate of .478 to .750 suggesting Δ0earners might indeed be endogenous in equation 3a. To test for correlation between Δ0earners and the error term in equation 3a, I used a refinement of a method suggested by Hausman (1978) and described in Wooldridge (2003:506-7). In one equation, the variable Δ0earners was regressed on the above named three exogenous variables of the 2sls regression of equation 3a. The residuals from this regression may be interpreted as what remains in Δ0earners after purging it of the

effects of the exogenous variables. Afterwards, equation 3a was again regressed by OLS with the saved residuals serving as an additional explanatory variable with Δ0earners, ΔTr, and Δg_e. Rejection of the null hypothesis that the coefficient of the purged residuals equals zero requires concluding Δ0earners is correlated with the error term. The coefficient of the residual was not significant suggesting Δ0earners is not endogenous in equation 3a after all.

The final but important test of the model is to examine whether Δg is a good proxy for changes in inequality in the sense that it satisfies the assumptions of being uncorrelated with the error term in equation 3. To do so I used Atkinson's inequality measure as an instrument for Δg and re-estimated equation 3 using 2sls. The dependent variable was the change in poverty. The Atkinson measure is only available from 1968 so comparisons between OLS and 2sls estimates have n equal to 34. The results of the 2sls regression confirm further the robustness of the model. Compared to the OLS regression, the 2sls regression explains 90% versus 91% of the variation in poverty; all explanatory variables remain significant at the 1% level; the coefficient on Δg changed from 47.71 to 53.34, well within the 95% confidence interval of the OLS estimate.

Data Issues

Official poverty statistics are determined by a definition of poverty developed during 1964 by Mollie Orshansky of the Social Security Administration. The official poverty rate is an absolute measure calculated with respect to several income thresholds updated each year to maintain them in constant dollars relative to the original base year (1963). Under the original measure of poverty, a person was determined to be in poverty if he or she lived in a family of type i with income $y < y_i$ where y_i represented the appropriate poverty threshold, i.e. the income below which a family of type i is deemed to be in poverty. Factors such as family size, gender of the family head, number of children under 18 years old, and farm-nonfarm residence determined the original family types and income thresholds. Initially, annual adjustments of poverty thresholds for inflation considered only price changes of household food items on which the original income thresholds were based.

Revisions to the methodology determining the poverty thresholds occurred during 1969 and during 1981. In 1969, the absolute income thresholds for non-farm families were retained from base year 1963 values, but the thresholds for farm families were raised from 70 to 85 percent of the thresholds for non-farm families. In addition, the process for calculating annual adjustments for inflation was amended to cover changes in the cost of all household consumer items by converting to using the CPI. For the

March 1982 CPS, the Census Bureau eliminated farm/non-farm and female/male householder differences in poverty threshold levels. It also increased the number of family types defined by family size. The combined effect of these changes increased the count of the poor, but the effects on subsequent published time series on poverty were probably small because currently published pre-1969 and 1981 poverty rates are based on the 1969 and 1981 changes wherever possible. For further details, see the section, "Changes in the Definition of Poverty" in Current Population Reports, Series P-60, No. 133.

During 1960 to 2001, the Bureau altered the methodology by which the March CPS is collected or processed some fourteen different times. Moreover, the Bureau (1988: 363) reports "any revision to the March processing system results in a disruption to the income and poverty time series." During some years, these changes simply amounted to using new population weighting procedures developed for a recent decennial census and had little effect on the estimated poverty rate. However, other changes have had obvious effects on the estimate of poverty. Most significant were a series of changes in the method by which sampled income data are processed. The Bureau's 1962 March survey was the first to assign imputed values to surveyed respondents with missing income responses, a procedure that might well be expected to significantly lower the estimated poverty rate relative to the previous year causing a break in the time series. Indeed, imputation procedures were introduced because the Bureau discovered missing income data were biased toward lower income households. Introduction of imputation and later changes in imputation procedures would therefore decrease poverty rates significantly more than concomitant increases in mean income and decreases in inequality would suggest in light of previous time series values. Furthermore, during some years processing changes affected measured mean income and inequality but not measured poverty. For example, during 1985 limits for recording earnings from a respondent's longest job increased from $99,999 to $299,999. That change added $22.9 billion to measured aggregate income affecting both mean income and inequality indices such as the gini, but could have no affect on the measure of poverty.

Another important source of breaks in the time series comes from changes in the price index used to adjust the poverty income thresholds for inflation. Economists generally agree that during the 1970s the CPI overestimated inflation because of its treatment of residential housing. Therefore, upward adjustments in the poverty thresholds based on the CPI were too high resulting in overestimates of the poverty rate. Overestimates appear to have been particularly acute during the high inflation of the

period 1974-1982. To correct for this, the Census Bureau in 1983 began adjusting the income thresholds with the CPI-U-RS index that altered the method by which housing services influence the CPI. Although current published poverty series attempt to create a consistent historical time series, the Bureau cautions that some breaks due to changes in price indices inevitably remain.[14].

[14] The Census Bureau also publishes a time series of poverty rates based on the BLS CPI-U-X1 price index which gives poverty rates significantly lower than the officially published series. It is clear that the official published poverty rates overestimate changes in the actual poverty rate during some years and some adjustment procedure must be used to correct this.

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