A New Look at the Distributional Effects of Economic Growth during the 1980s: A Comparative Study of the United States and Germany

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Beginning in 1983,and following the worst recession since the Great Depression, the United States experienced six years of uninterrupted economic growth, the longest such period since World War II. Along with this expansion came an increase in income inequality that many suggest diminished the middle class and made the United States unique among industrialized nations in its pace of economicgrowth and increase in income equality.

This paper addresses these issues by using kernel density estimation to document changes in the United States income distribution during the 1980s economic expansion and to compare these changes to those experienced in Germany. The findings confirm that income inequality did increase and the United States middle class did lose members during the 1980s. However, these outcomes were due largely to real income gains rather than real income losses. The comparative analysis shows that these patterns were similar to those observed in Germany.

For over 25 years following World War II, the benefits of economic growth were distributed more or less uniformly throughout the income distribution. In 1973, however, the gains from economic expansions began to flow more heavily toward the top of the distribution, increasing income inequality, diminishing the middle class, and raising concerns that the link between economic growth and broad based prosperity had been broken (U.S. Bureau of the Census 1991; Karoly 1993; Easterlin, MacDonald, and Macunovich 1991). As the last decade of the 20th century began, these concerns intensified. Despite six years of sustained economic expansion, the decade of the 1980s closed with a higher degree of income inequality, a larger number of individuals in poverty, and a smaller portion of the population in the middle of the income distribution than hadbeen there at its beginning. In combination, these circumstances struck a nerve among policymakers, researchers, and the public alike, and prompted many to ask whether the government should take a more active role in guaranteeing the equality of outcomes among the population.

At the heart of this questioning were two suspicions. The first was that the increases in poverty and inequality and the decline in the middle of the distribution were linked, implying that economic growth was benefiting only the wealthiest of the population (Duncan, Smeeding, and Rodgers 1992; Karoly and Burtless 1995). The second was that the increase in inequality and the decline in the middle of the distribution were outcomes unique to the United States and not experienced in industrialized nations with more intervention-oriented economic policies (Burtless and Smeeding, 1995).

In many ways research on the changing patterns of the United States income distribution during the 1980s lends credence to these suspicions.[1] The large body of research on the United States income distribution shows that income inequality increased in the United States during the last decade and suggests that these changes diminished the middle class and left the "vulnerable" more exposed to economic losses due to a weakened social safety net (Karoly and Burtless 1995; Karoly 1993; Duncan, Smeeding, and Rodgers 1992). The international literature indicates that

1. See Levy and Murnane (1992) and Karoly (1993) for a review of this literature.

while inequality has grown in other western industrialized countries throughout the 1980s, the United States had the highest level of income inequality (Gottschalk and Smeeding forthcoming).

These images of the patterns of inequality in the United States during the last decade and their relationship to those in other industrialized countries are based almost entirely on parametric measures, such as the Gini or Theil coefficients, which summarize information about the income distribution into a single number. While these measures provide useful indications of changes in the overall income distribution, a richer picture of the 1980s can be seen by comparing changes in the entire income distribution over the period. This can be done using a statistical technique known as kernel density estimation to draw a picture of the distribution of income for each country in each year of the period. The benefit of this technique is that it provides a direct means of examining where changes in the distribution of income have occurred and whether the changes are similar or different across countries.[2]

Using kernel density estimation, this paper first examines the effects of 1980s economic growth on the distribution of income in the United States. To assess whether the experience of the United States was unique, the United States outcomes are compared to outcomes in Germany, a country with significantly lower levels of inequality, an explicit commitment to preserving the relative economic status of its citizens, and an economic and political experience during the 1980s that mirrored that of the United States.[3]

This paper first describes the influence of the 1980s economic expansion on the level and character of inequality in the United States. The paper then examines whether the outcomes realized in the United States were unique by comparing outcomes in the United States and Germany. Such a comparison can determine whether the disparate inequality profiles for the United States and Germany are representative of real differences in the impact of the 1980s economic expansion on the populations of the two countries or whether they are the result of the measurement tools used to characterize income distributions. Furthermore this comparison provides information about the extent to which explicit commitments to relative income equality, like the ones made in Germany, equalized the gains and losses experienced by various sub-populations during the 1980s.

2. See Burkhauser, Crews, Daly, and Jenkins (1996), DiNardo, Fortin, and Lemieux (1996), Ginther (1995), and Jenkins (1995) for examples of analyses of income and earnings distributions using kernel density estimation.

3. For a complete examination of these changes, see Smyser (1993).

I. METHODOLOGY

Estimation Methods

There are a variety of ways in which information about the changing shape of income distributions can be summarized. Traditionally this has been done with parametric summary measures, such as Gini or Theil coefficients, or with fixed-width histograms, which rely on a small number of class distinctions. These measures capture some information about broad changes in the population income distribution, but they are less effective in providing details of how individuals at all income levels are affected over time. Moreover, there is no consensus about the appropriate parametric measure or the number and sizes of the classes to use, and the empirical findings are often sensitive to the methods chosen.

Kernel density estimation is an attractive alternative to traditional summary statistics or graphical methods for measuring income inequality. It provides a picture of the entire distribution in terms of the income frequency density function, from which the distribution's level, modality, and spread can be observed simultaneously. These characteristics make kernel density estimation an ideal method for identifying the links between economic growth and income inequality.

The kernel density approach is a formal method of fitting a curve to an empirical frequency distribution. In their simplest forms, kernel estimators are much like smoothed histograms: data in a neighborhood around a point are used to estimate the distribution of a variable of interest (e.g., income) over a population. However, while histograms restrict observations to fall into only one neighborhood group, kernel estimators allow an observation to be included in several neighborhood groups, which results in a smoothing of the distribution shape.

A kernel density estimator can be thought of as a viewing window that slides over the data. The estimate of the density depends on the number of observations that fall within the window as it passes along the income scale. A simple example of such an estimator is one which uses a window of data with half-width (or bandwidth) h_n, and, for each point in the sample, the density estimate is equal to the number of points that fall in the interval $(-h_n, h_n)$ centered on the point. The density is then scaled by the number of observations and the width of the window. For a sample of size n, the estimator just described for the point x_i has the form

$$\hat{f}_n(x_i) = \frac{1}{n}\frac{1}{2h_n}\{\textit{number of } x_1,\ldots,x_n \textit{ falling in } (x_i-h_n, x_i+h_n)\}.$$

If a weighting function W is defined such that $W(t) = 1/2$ if $t < 1$, and 0 otherwise, then the estimator may be written as

$$\hat{f}_n(x_i) = \frac{1}{n}\sum_{j=1}^{n}\frac{1}{h_n}W\left(\frac{x_i - x_j}{h_n}\right).$$

The weighting function W is a member of the class of functions known as kernels, where kernel refers to the rule used to assign weights to the observations. The only restriction on a kernel function, K, is that it integrates to 1 over the range covered by the distribution. Any probability density function satisfies this condition. The kernel density estimator has the same differentiability properties as the kernel function chosen. Although K is often symmetric, the resulting density estimate does not inherit this characteristic.

For consistency of the kernel estimator, the bandwidth h_n should decrease as the sample size increases. Choosing an optimal bandwidth is difficult to do, however, because the data vary in sparseness over the range of the distribution, and setting a bandwidth based on the sparse data areas will lead to oversmoothing in the denser areas. Ideally, the bandwidth should respond to the amounts of information at different points in the distribution, becoming narrower in dense parts of the distribution (the middle) and wider in sparse parts (the tails). This feature is obtained by using adaptive bandwidths which vary with the amount of information available.

One way to calculate adaptive bandwidths is to use a two-stage procedure that relies on pilot estimates of the density, obtained from fixed bandwidth estimates, to calculate bandwidth weighting factors. These weighting factors are then used to adjust the bandwidths over the range of the data. The factors, λ_i, are defined as

$$\lambda_i = \sqrt{\frac{e^{\frac{1}{n}\sum_{j=1}^{n} w_j \log \tilde{f}_n(x_j)}}{\tilde{f}_n(x_i)}},$$

where $\tilde{f}_n(x)$ is the pilot estimate of the density. The adaptive kernel density estimator for the point x_i is then

$$\hat{f}_n(x_i) = \frac{1}{n}\frac{1}{h_n}\frac{1}{\lambda_i}\sum_{j=1}^{n} w_j K\left(\frac{x_i - x_j}{h_n \lambda_i}\right),$$

where the weighting function W has been replaced by the more general form K, and the weighting variable w_j is included to account for sample design. The estimator $\hat{f}$ is the kernel density estimator used in the analysis. The kernel function used in this analysis is the Epanechnikov kernel function.[4]

II. YEAR SELECTION, DATA, AND VARIABLE DESIGN

Business Cycles and the Income Distribution

Although most economists take for granted that any examination of changes in the income distribution over time will be sensitive to the years being considered, research in this area has frequently failed to distinguish between changes associated with movements in the business cycle and changes that occur between two similar points in the business cycle (Burkhauser, Crews, and Daly, forthcoming). While there are no formal rules for choosing comparison years, Figure 1 illustrates the potential problem with selecting analysis years randomly. Figure 1 shows median real family income in the United States over the past twenty-five years. If one were to compare median real income in 1979 and 1992, one would get the impression that the decade of the 1980s left the median American worse off.[5] However, 1979 is a peak year and 1992 is a trough year of two different business cycles. Looking peak to peak (1979–1989) in Figure 1 a very different impression emerges. Median real income actually rose by almost $3,000 during this period. This simple exercise confirms the common sense notion that income distribution comparisons are sensitive to business cycle fluctuations and underscores the importance of careful year selection.

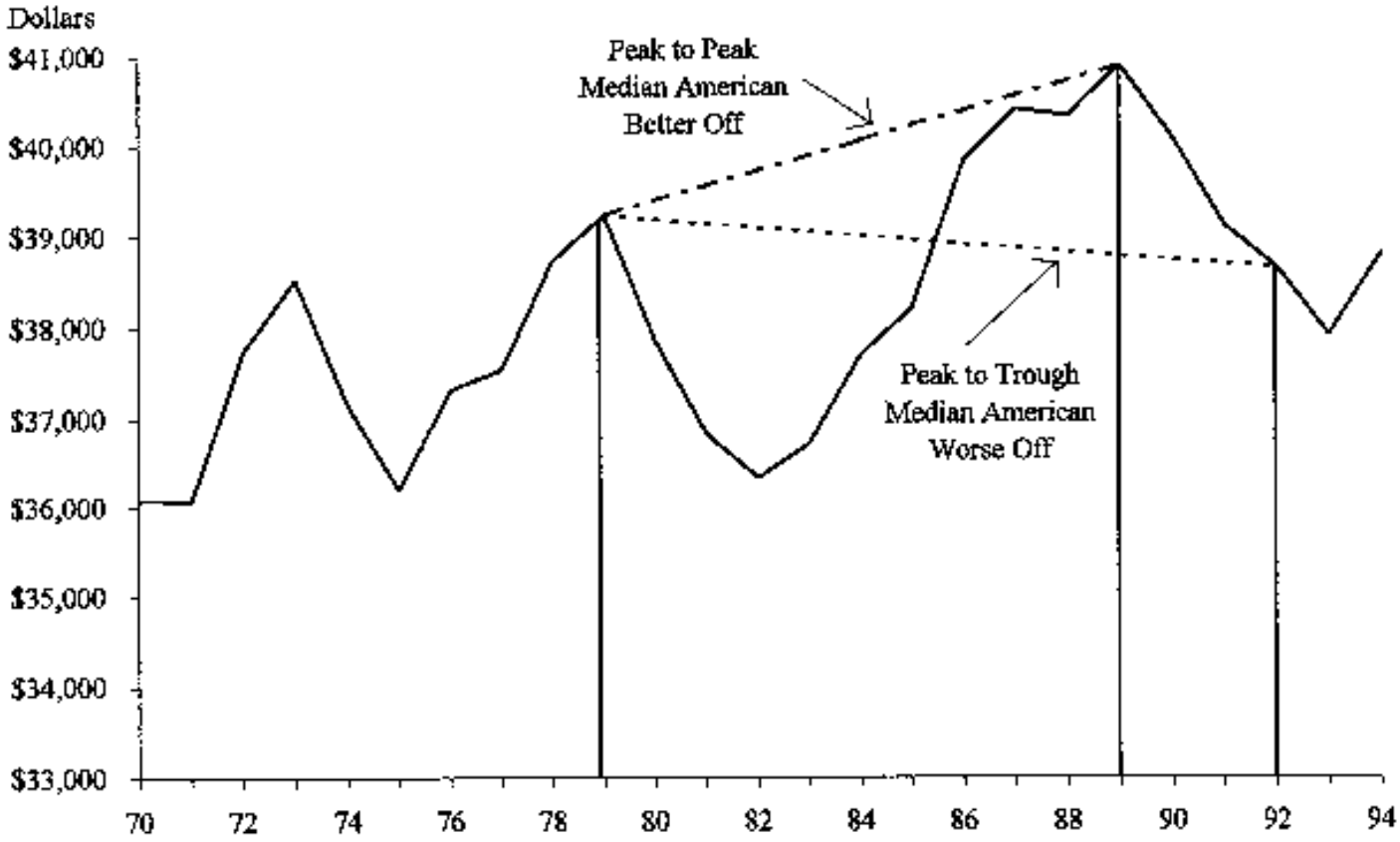
Figure 2 plots real Gross Domestic Product (GDP), real personal income growth, and the unemployment rate for both the United States and Germany. The top panel of Figure 2 shows that the United States economy experienced a serious recession in the early part of the 1980s, with unemployment peaking at post-World War II highs in 1982. This was followed by substantial economic growth and falling unemployment rates for the rest of the 1980s. Like the United States, Germany experienced a recession in the early 1980s as well as a strong economic recovery through the rest of the decade. However, the unemployment rate,

4. The reported results are not sensitive to the choice of kernel functions. See Burkhauser, Crews, Daly, and Jenkins (1997) for results using the normal kernel function.

5. Danziger and Gottschalk (1995), Burtless (1996a, 1996b) and Karoly (1996) comparing these years have characterized the 1980s as a decade in which "the rich got richer and the poor got poorer."

FIGURE 1

REAL MEDIAN FAMILY INCOME IN THE UNITED STATES, 1970–1994



which was below that of the United States at the start of the decade, was higher throughout the second half of the decade.

Data constraints for Germany make peak-to-peak comparisons impossible. However, data are available to examine the first and last years of economic expansion in each country. The selected years are marked by vertical lines in Figure 2. In the United States 1983 and 1989 are used; in Germany 1984 and 1991 are chosen. These years approximate the points at which all three measures, real GDP, real personal income, and unemployment pointed to the beginning and end of economic expansion.

Data

The two data sets used in this study are the 1990 Response-Nonresponse File of the United States Panel Study on Income Dynamics (PSID), including the SEO over-sample of low-income people and the 1997 Syracuse University English Language Public Use File of the German Socio-Economic Panel (GSOEP)[6]. Selected years of these surveys were chosen to capture the first and last complete year of the economic expansion during the 1980s. In the United States, survey years 1984 and 1990 were selected; in Germany survey years 1985 and 1992 were selected. These survey years correspond to income flows for 1983 and 1989 in the United States and 1984 and 1991 in Germany.

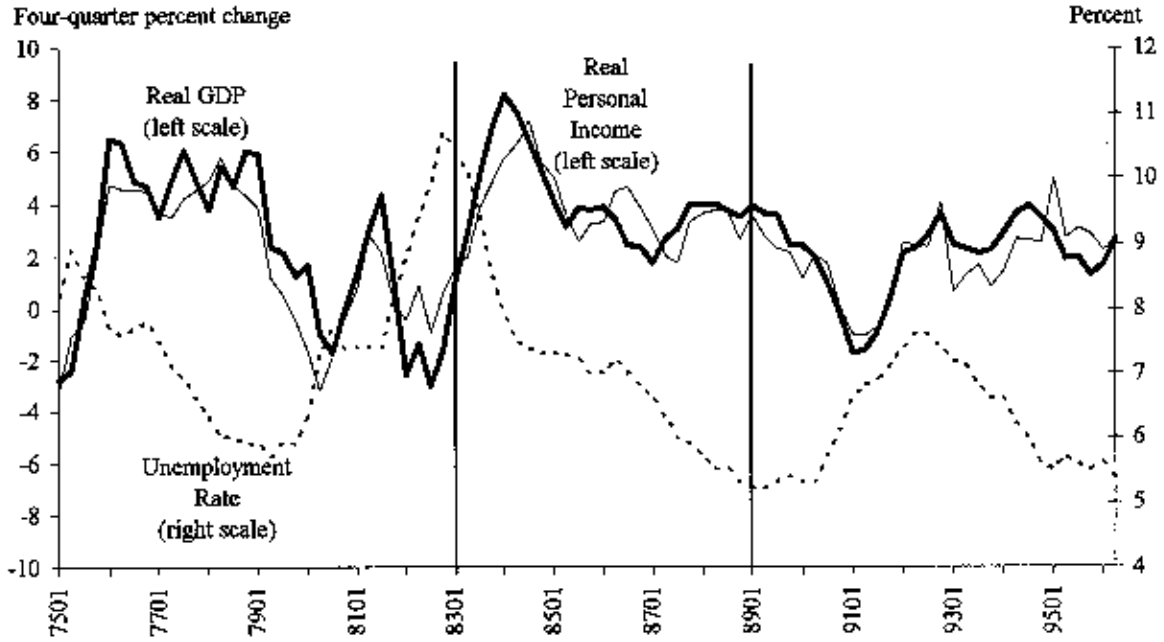
The PSID data span over two decades from 1968 to 1989. The panel began with a sample of 5,000 families, including a disproportionate number of low-income families. As of 1990 the PSID contained information on more than 35,000 individuals, approximately 20,000 of whom were

6. In the United States, cross-sectional analyses of this type typically use data from the Current Population Survey. However, since Germany does not produce an equivalent to the CPS, this analysis uses PSID data which are comparable in design, sample size, and content to data from the GSOEP. In comparative work, data from the PSID and CPS have been shown to produce equivalent results; see Burkhauser, Crews, Daly, and Jenkins (1996) and Burkhauser and Crews (1997) for examples.

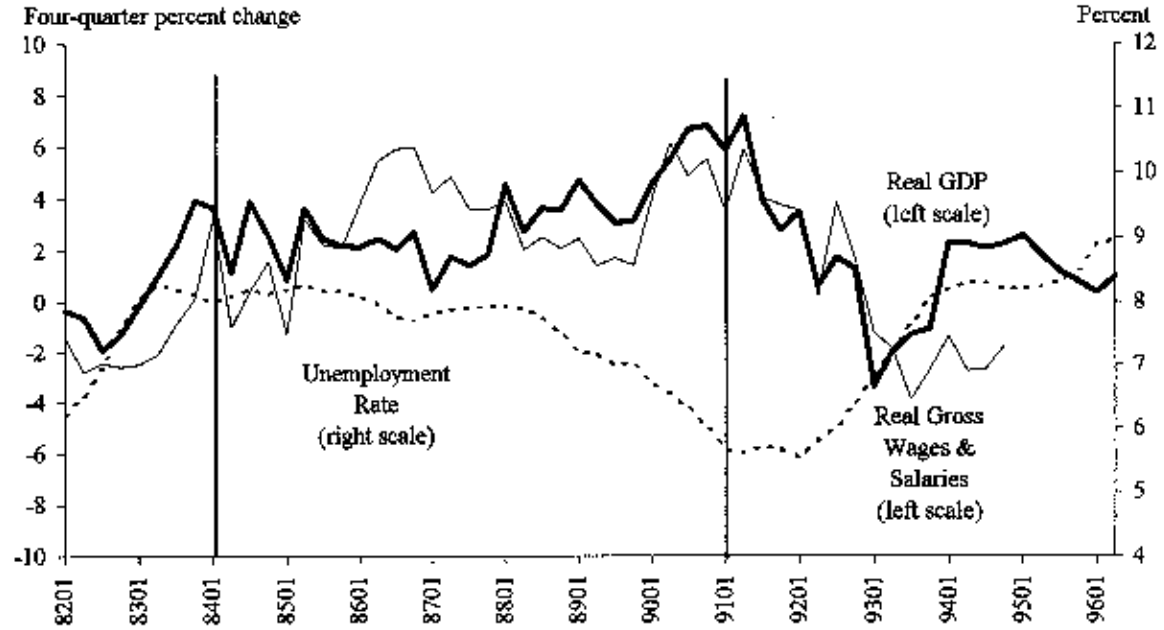
FIGURE 2

THE UNEMPLOYMENT RATE AND REAL GROWTH IN GROSS DOMESTIC PRODUCT AND PERSONAL INCOME IN THE UNITED STATES AND GERMANY

UNITED STATES



WEST GERMANY



current respondents. The remaining 15,000 individuals are currently nonrespondents but have participated in the survey at some time. Non-sample individuals, unrelated by marriage or birth to one of the original 5,000 families, are excluded from the analysis. The PSID does not provide sampling weights for these individuals, and therefore they cannot be included in our analysis.[7]

The GSOEP began in 1984 with a sample of 6,000 families including a disproportionate number of non-German "guest-workers." The GSOEP currently contains data on approximately 6,000 families and nearly 14,500 individuals. Although the GSOEP now includes data on those living in the former German Democratic Republic, in this study the analysis is restricted to those living in states of the Federal Republic of Germany prior to reunification.[8] Although both the PSID and GSOEP are panel surveys, in this analysis they are treated as annual cross sections. Thus, no attempt is made to follow individuals over time. Both data sets can be weighted to represent their respective populations. The appropriate weights are applied throughout the analyses.

Measuring Economic Status

Because most people share resources within families, the family is usually considered the appropriate unit for collecting information on economic status. That approach is followed here. A family is defined as all individuals living in a household who are related by blood or marriage or who are cohabitating. Unrelated individuals sharing resources as roommates are treated as individual single-person families. To ensure that the cross-national comparison captures differences in outcomes that are allowed to prevail in both countries, this paper uses family post-tax post-transfer money income which includes in-cash government transfers and federal income and employment taxes.[9] Family income is calculated by summing the sources of income for all family members during a calendar year. To obtain a more comprehensive income measure, the in-cash value of food stamps is added in the United States, the imputed rental value of owner-occupied housing is included in the United States and Germany, and the value of housing benefits is counted in Germany.[10] All incomes are converted to 1991 dollars using the CPI–UX1 in the United States and to 1991 deutsche marks using the IMF Consumer Price Index in Germany.[11]

There are many reasons why family income is less than an ideal measure of economic status (Moon and Smolensky 1977). One of the most important is differences in family size. To account for the fact that $200 a week provides a higher standard of living for a single-person family than it does for individuals belonging to larger families, the family income measure is deflated by an equivalence factor. Since there is no universally accepted equivalence scale, one commonly used by cross-national researchers (Burkhauser, Smeeding, and Merz 1996) which has an elasticity of 0.5 is applied.[12] An elasticity of 0.5 assumes the median value of the potential returns to scale (ranging from 0 to 1) is operative.

III. INEQUALITY AND ECONOMIC EXPANSION

Before discussing findings from the kernel density estimation, we present the results from parametric measures of economic well-being and inequality in Table 1. Among the most utilized measures of income inequality is the Gini coefficient. The Gini is a measure of relative income inequality constructed by comparing the degree to which

7. For a more detailed discussion of these data see Hill (1992).

8. For a more complete discussion of these data, see Wagner, Burkhauser, and Behringer (1993).

9. The tax burden for families in the GSOEP was computed using tax calculation routines first developed by Johannes Schwarze of the Deutsches Institut für Wirtschaftsforschung. A detailed discussion of the simulations is found in Schwarze (1995). For the United States the tax routine was provided in the PSID data. In both the United States and Germany the tax models ignore local and state taxes on property or income. Sales taxes are also ignored. Tax-adjusted values for both data sets are available in the Syracuse University Panel Study of Income Dynamics and German Socio-Economic Panel Equivalent Data File. See Burkhauser, Butrica, and Daly (1995) for a detailed discussion of these data.

10. The PSID does not record cash transfers specifically for housing, nor does it provide an estimate of the cash value of government provided housing. No attempt is made to impute a value for this variable, since housing related transfers represent a small fraction of the overall transfer benefits provided to needy citizens.

11. Burkhauser, Crews, and Daly (forthcoming) show that income distribution analysis is sensitive to the price index selected. The indexes selected for this analysis are both standard in the literature and thought to overstate, rather than understate, inflation. Thus, an alternative index would most likely strengthen the results reported here.

12. Equivalence scales contain assumptions about the returns to shared living. An equivalence scale with an elasticity of 1 would imply that two individuals living together require twice as much income to be equally well-off. Equivalence scales with an elasticity of 0 assume that a household with an infinite number of individuals can live equally well off the income of a single person household. Thus, an elasticity of 0.5 assumes that the true economies of scale lie directly in between these two extreme values. See Burkhauser, Smeeding, and Merz (1996) for a discussion of the sensitivity of different equivalence scales in cross-national comparisons.

TABLE 1

SUMMARY MEASURES OF FAMILY SIZE-ADJUSTED INCOME INEQUALITY FOR INDIVIDUALS IN THE UNITED STATES AND GERMANY

	ALL PERSONS					
	UNITED STATES			GERMANY		
	1983	1989	PERCENT CHANGE	1984	1991	PERCENT CHANGE
GINI	0.352	0.383	8.8	0.279	0.280	0
90/10 RATIO	5.72	6.23	8.9	3.33	3.54	6.3
90/50 RATIO	2.07	2.19	5.8	1.73	1.83	5.8
50/10 RATIO	2.76	2.81	1.8	1.92	1.94	1.0
MEDIAN FAMILY SIZE-ADJUSTED INCOME	$17,761	$19,663	10.7	DM25,154	DM29,897	18.9
MEAN FAMILY SIZE-ADJUSTED INCOME	$20,581	$23,885	16.1	DM27,763	DM33,123	19.3
STANDARD DEVIATION OF FAMILY SIZE-ADJUSTED INCOME	$15,736	$22,956	45.9	DM17,062	DM18,871	10.6
SAMPLE SIZE	6,918	7,328	NA	5,043	4,391	NA

Post-transfer, post-tax family size-adjusted income per individual in 1991 dollars based on data from the *Panel Study of Income Dynamics.*

Post-transfer, post-tax family size adjusted income per individual in 1991 DM based on data from the *German Socio-Economic Panel.*

income is proportionally distributed throughout the population. When income is distributed equally the Gini coefficient equals 0; thus higher values of the Gini index represent higher degrees of inequality. A second set of measures reported in Table 1 are percentile point measures. These measures calculate the absolute difference in the level of income held by individuals at different percentiles of the population.[13] Table 1 reports values for three such measures: the 90/10, 90/50, and 50/10.

Inequality in the United States is substantially higher than in Germany. Moreover, while the Gini coefficient increased by 10 percent in the United States between 1983 and 1989, it remained constant in Germany. However, because the Gini coefficient summarizes movements in the entire income distribution in a single number, it cannot detect the movements within the distribution hinted at by the three percentile point measures. Moreover, since the Gini measures relative rather than absolute inequality, findings between the two types of measures may differ. Over the expansion period studied for each country the 90/10 measure grew by 8.9 percent in the United States, and by 6.9 percent in Germany. Most notably, in both countries increases in the 90/50 measure outpaced growth in the 50/10 measure, implying a larger increase in dispersion at the high end of the income distribution than at the low end.[14]

Overall, the results reported in Table 1 illustrate some of the difficulties of relying on single summary measures of inequality to characterize changes in an entire distribution. While they provide useful information, by definition they constrain the analysis to just one parameter. The percentile point measures are more flexible, but force the researcher to specify particular points a priori. In contrast, kernel density estimation records the relative concentration of individuals at each income level without any parametric specifications or assumptions and provides a straightforward method of comparing changes in these concentrations over time.

IV. VIEWS OF THE INCOME DISTRIBUTION USING KERNEL DENSITY ESTIMATION

The remaining analysis uses kernel density estimation to provide pictures of the entire distribution of income in

13. The formulas for computing the Gini index and the various percentile point measures are provided in the Appendix.

14. See Gottschalk and Smeeding (forthcoming) for similar results using data from the Luxembourg Income Study.

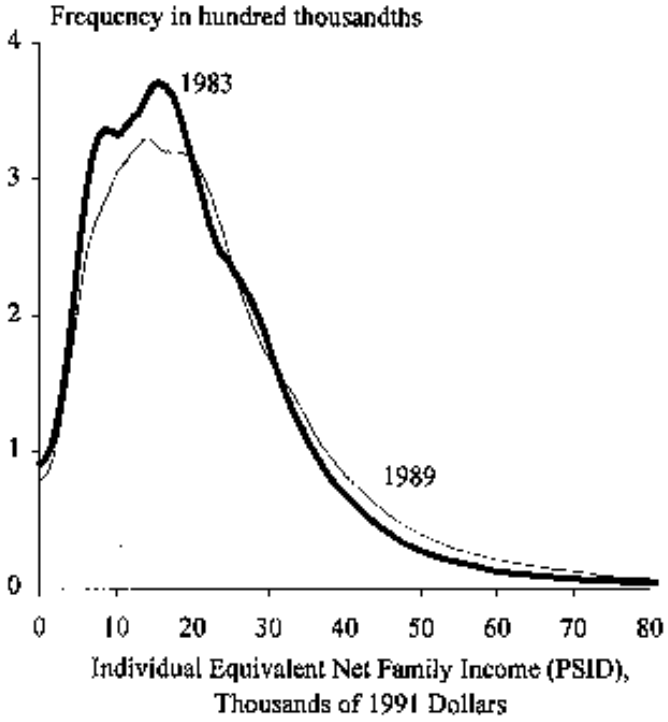
each year under study. Estimates of the income frequency density functions for the full population of the United States in 1983 and 1989 are shown in Figure 3. As Figure 3 reveals, the economic expansion affected both the shape and position of the income distribution. Comparing the 1983 and 1989 curves shows that economic growth improved the economic fortunes of nearly the entire population while increasing income inequality. The figure shows that for a large fraction of the population, economic growth translated into increases in economic well-being. However, for a small proportion of the population, economic well-being declined between 1983 and 1989, a point demonstrated by the portion of the 1989 curve lying to the left of the 1983 graph. Such shifts in the income distribution during an economic expansion are not particularly surprising and have been documented in the literature.

What is less well-known is the extent to which the 1980s expansion altered the shape of the income distribution. Figure 3 shows that in addition to lying to the right of the 1983 distribution, the income distribution in 1989 is shorter, wider, and has a thicker right tail. During the expansion period the proportion of the population in the middle of the income distribution declined, pushing mass into the tails of the distribution and increasing income inequality. However, as Figure 3 illustrates, this displacement of the middle mass did not flow equally into the lower and upper parts of the distribution. The vast majority of the lost middle slid to the right, representing an improvement, rather than a decline, in economic well-being. The figure shows that although income inequality rose during this period, it was not because the rich got richer and the poor and the middle income groups became worse off, but rather because a significant fraction of the middle mass fell to the right while a small proportion of the population remained stuck at the bottom.

Figure 4 portrays a similar situation for Germany in 1984 and 1991. The large hill in the middle of the distribution in 1984 fell mostly forward, substantially increasing the right side of the hill. As in the United States, the shift in concentration away from the middle was asymmetric. The increase in the density within the higher income groups was larger than the increases in the lower

FIGURE 3

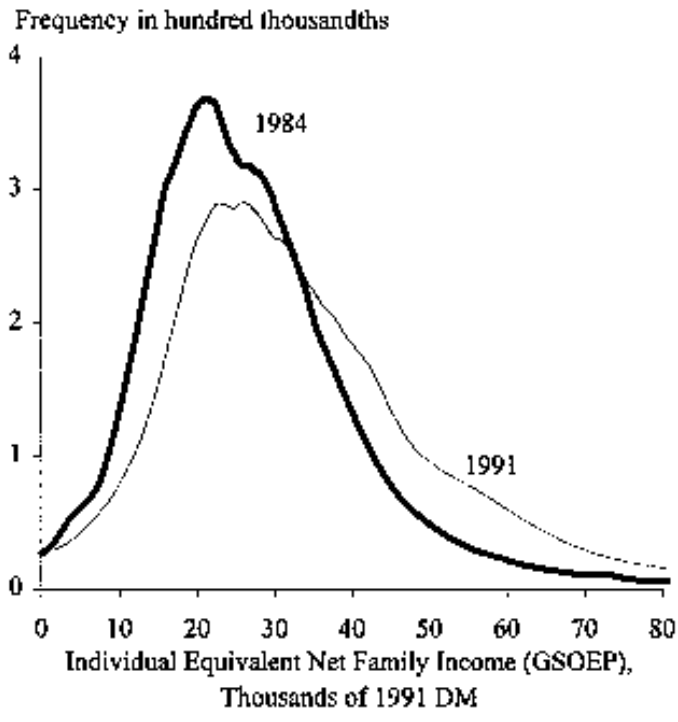
THE INCOME DISTRIBUTION IN THE UNITED STATES IN 1983 AND 1989: CROSS-SECTIONAL DATA (TOTAL UNITED STATES POPULATION)



SOURCE: Authors' calculations based on PSID (1984 and 1990)

FIGURE 4

THE INCOME DISTRIBUTION OF GERMANY IN 1984 AND 1991: CROSS-SECTIONAL DATA (TOTAL GERMAN POPULATION)



SOURCE: Authors' calculations based on GSOEP (1985 and 1992)

income ranges. Thus, as in the United States the increased income inequality that accompanied economic growth was associated with increases in absolute economic well-being for most of the population.

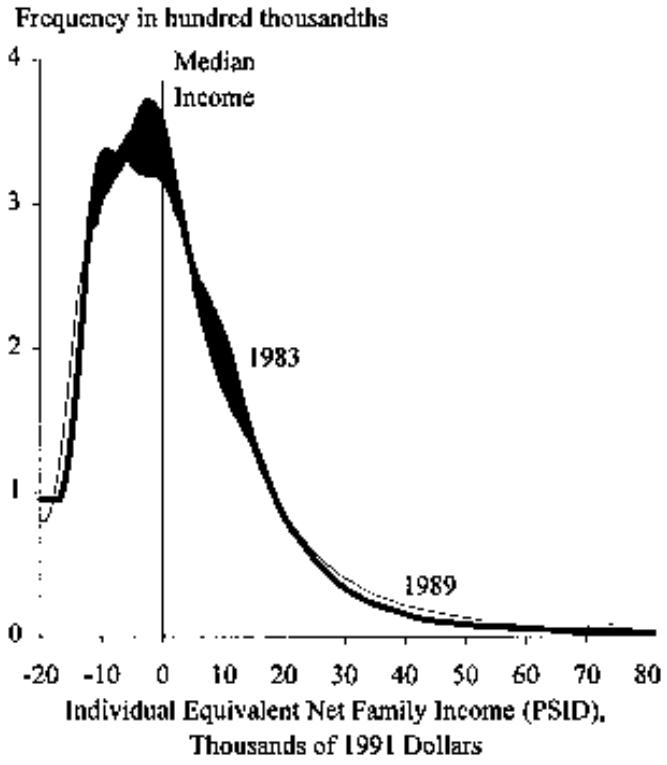
To verify that the inequality findings in Figures 3 and 4 are robust, Figures 5 and 6 show the same distributions normalized by median income in each year. Comparing these median preserving distributions of income in the United States and Germany verifies that economic expansion increased the dispersion in the income distribution of each country. In both the United States and Germany the middle mass of the income distribution diminished, and the mass in the left and the right tails increased. Thus, while economic recovery improved the absolute position of almost all members of the population (as demonstrated in Table 1 and Figures 3 and 4), in relative terms some portions of the population benefited more than others. The next section investigates which sub-populations reaped the largest benefit from the 1980s expansion.

V. THE EFFECTS OF EXPANSION ON POPULATION SUB-GROUPS

To better understand how certain sub-groups within the population were affected by the decade of the 1980s, the population is divided into persons living in three types of families. The division is based on the age and labor market connection of the primary adults in the family, defined as the head and, if relevant, the spouse or partner. The first group includes all persons who live in families in which the primary adults are younger than age 60 and at least one works in the labor market. The second group includes all families with at least one primary adult aged 60 or older; this categorization captures retired workers and their families, most of whom rely on social insurance and private pensions for their income support. The third group contains persons living in non-aged families in which no primary adult is working in the labor market; this final group includes families most likely to rely on some form of social

FIGURE 5

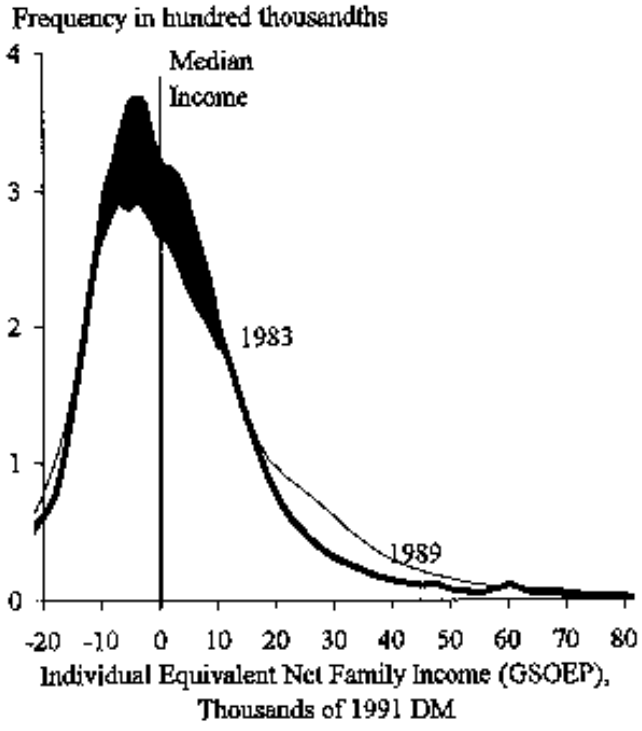
MEDIAN PRESERVING VIEW OF THE INCOME DISTRIBUTION IN THE UNITED STATES IN 1983 AND 1989



SOURCE: Authors' calculations based on PSID (1984 and 1990)

FIGURE 6

MEDIAN PRESERVING VIEW OF THE INCOME DISTRIBUTION OF GERMANY IN 1984 AND 1991



SOURCE: Authors' calculations based on GSOEP (1985 and 1992)

assistance, such as AFDC, General Assistance, and Supplementary Security Income, for their income support.

These three groups are selected for a number of reasons. First, in a society where work is the primary source of income, those persons living in families headed by a person who does not work are most likely to be vulnerable to economic risks. Hence, older people, who are predominately retired, and the families of younger heads who are not in the labor market are compared with the majority of younger families with one or two working adults. Second, during the period of strong economic growth that dominated the second half of the 1980s, public expenditures on social protection as a percentage of GDP fell in both the United States and Germany. To the extent that this decline reflects changes in the amount of social protection provided to younger non-working individuals and the elderly, the income distribution patterns among these groups and the remaining families should be different. Finally, while economic recovery is likely to increase the economic well-being of working individuals and their families, it is less clear how it will affect those families headed by older retired individuals or younger non-workers. Evaluating the experiences of each of these groups separately allows for the direct examination of the comparative changes in economic well-being over the last decade.

Table 2 reports the proportion of the population occupying each of these groups during the analysis years. As Table 2 indicates, the proportion of persons living in families headed by an older individual increased in both countries, moving above 20 percent of the total population in the United States and above 25 percent of the total population in Germany. This increase is consistent with demographic trends in both countries. Among the younger population, the proportion of persons living in families without a primary adult in the labor market decreased in both countries.

The results for the total population described in Figures 3 through 6 showed that in both countries the strong growth years contributed to inequality but did so in a way that disproportionately improved economic well-being. However, despite these disproportionate increases in economic well-being, a portion of the population was not helped by the recovery. To identify what segment(s) of the population did not benefit from economic growth, changes in income distribution among the three sub-groups are examined. Figures 7A–C show the graphs of the density functions for 1983 and 1989 by group for the United States. Figures 8A–C portray equivalent results for Germany. Combined, these figures show that the recovery did not affect all groups equally. Figure 7A portrays the income distribution for persons living in families with at least one younger primary

TABLE 2

PROPORTION OF POPULATION CLASSIFIED IN EACH GROUP BY YEAR

	UNITED STATES		GERMANY	
	1983	1989	1984	1991
	WEIGHTED PERCENTAGE	WEIGHTED PERCENTAGE	WEIGHTED PERCENTAGE	WEIGHTED PERCENTAGE
TOTAL POPULATION	100	100	100	100
PERSONS LIVINGIN FAMILIES HEADED BY SOMEONEAGED 60 OR OLDER[a]	18.6	21.5	25.8	27.8
FAMILIES HEADED BY SOMEONE UNDER AGE 60[b]				
PERSONS LIVINGIN FAMILIES WITHAT LEAST ONE PRIMARYADULTWORKING INTHE LABOR MARKET[c]	76.0	74.0	68.1	67.2
PERSONS LIVINGIN FAMILIES WITH NO PRIMARY ADULTS WORKING IN THE LABOR MARKET[d]	5.4	4.5	6.2	5.0

[a]Families in which the head or wife (partner) is aged 60 or older.

[b]Families in which neither the head nor wife (partner) is aged 60 or older.

[c]Families in which either the head or wife (partner) reported positive labor earnings.

[d]Families in which neither the head nor wife (partner) reported positive labor earnings.

FIGURE 7A

THE INCOME DISTRIBUTION OF THE UNITED STATES IN 1983 AND 1989: CROSS-SECTIONAL DATA (YOUNGER WORKING POPULATION)

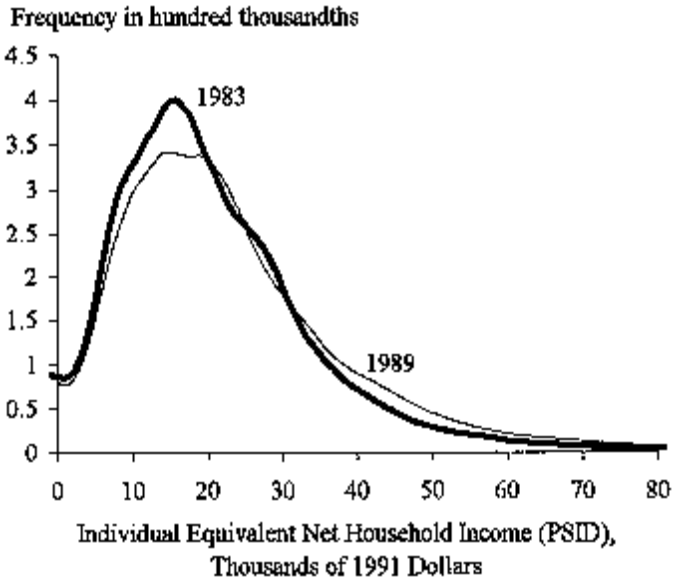


FIGURE 7B

THE INCOME DISTRIBUTION OF THE UNITED STATES IN 1983 AND 1989: CROSS-SECTIONAL DATA (POPULATION AGE 60+)

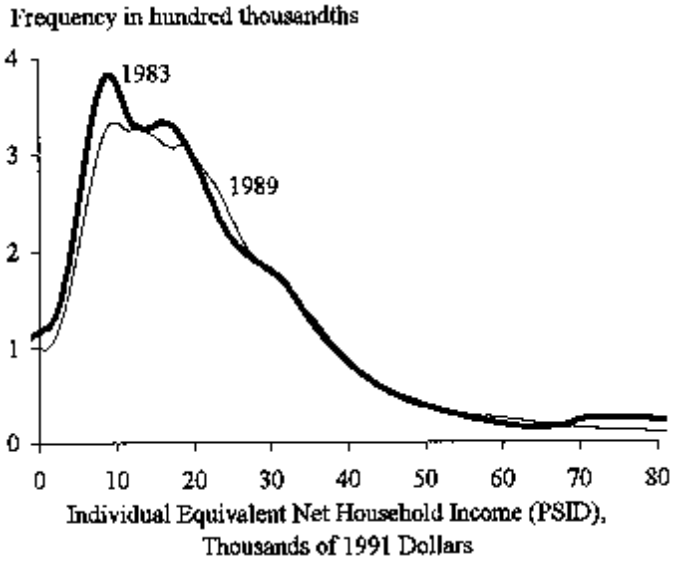
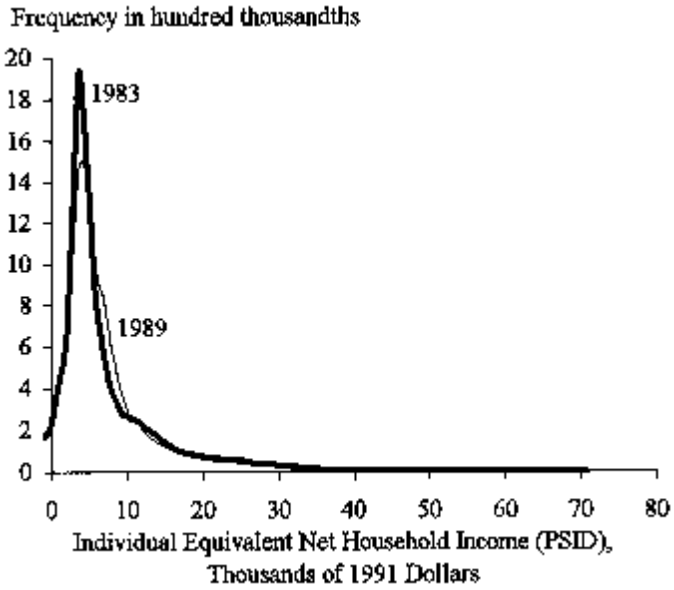


FIGURE 7C

THE INCOME DISTRIBUTION OF THE UNITED STATES IN 1983 AND 1989: CROSS-SECTIONAL DATA (YOUNGER NON-WORKING POPULATION)



adult worker. As Figure 7A shows, economic growth during the 1980s significantly improved the economic well-being of younger working families.[15] This pattern of change in economic fortunes also occurred in the older group. Although those over age 60 are frequently considered among those vulnerable to being left behind during periods of economic recovery and social policy retrenchment, almost the entire 1983 peak slid forward for this group, so that by 1989 the bulk of the older group was better off.

In contrast to the other two groups, persons living in families without a younger working head or partner were not among the beneficiaries of economic growth. Figure 7C demonstrates this point. The graphs of the 1983 and 1989 income distributions lie nearly on top of one another at the largest concentration of mass. Moreover, this concentration of mass is at the lower end of the distribution, under $10,000.

Figures 8A–C examine changes in the income distribution by group for Germany. The patterns observed in the United States are also observed for Germany. Figure 8A

15. Analysis of younger families with one and two earners revealed similar patterns. Dual-earner families have higher average income than single-earner families, but relative to their starting positions both benefited equally from economic expansion.

FIGURE 8A

THE INCOME DISTRIBUTION OF GERMANY IN 1984 AND 1991: CROSS-SECTIONAL DATA (YOUNGER WORKING POPULATION)

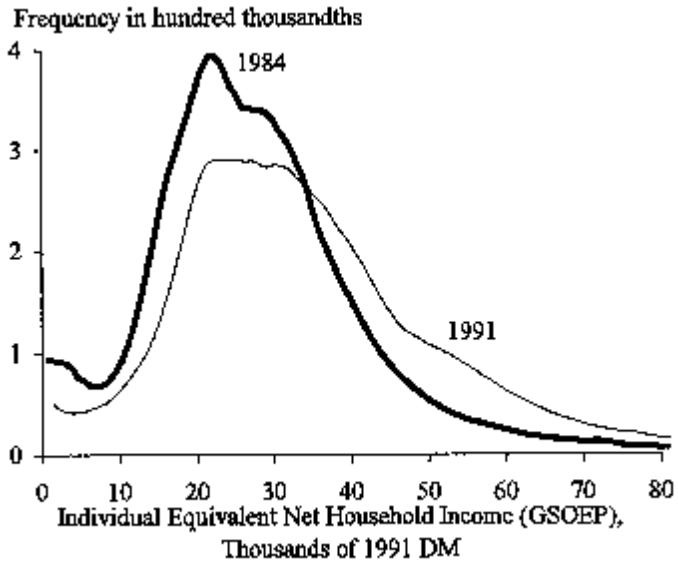


FIGURE 8B

THE INCOME DISTRIBUTION OF GERMANY IN 1984 AND 1991: CROSS-SECTIONAL DATA (POPULATION AGE 60+)

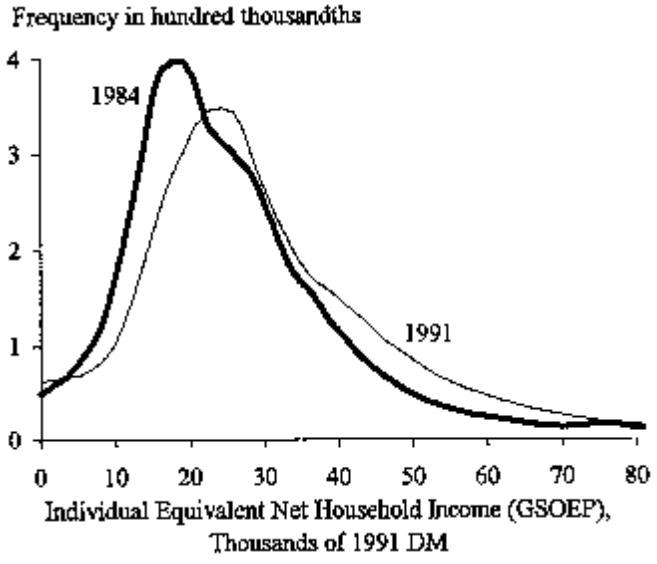
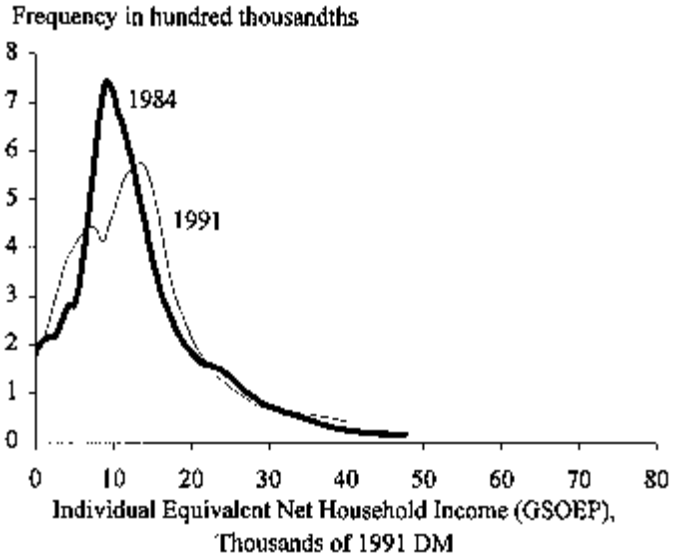


FIGURE 8C

THE INCOME DISTRIBUTION OF GERMANY IN 1984 AND 1991: CROSS-SECTIONAL DATA (YOUNGER NON-WORKING POPULATION)



shows that for younger German families with at least one adult worker, the economic recovery substantially improved the fortunes of the majority of the population.[16] As was the case for the total German population, a disproportionate amount of the decline in the middle of the distribution of persons living in younger working families fell to the right. Germans living in older families fared even better during the recovery, as their entire distribution of income shifted to the right.

Unlike Germans living in younger working families or in older families, the Germans living in younger non-working families did not benefit uniformly from the long period of economic recovery. In contrast to the other groups, as can be seen in Figure 8C, the substantial decline in the middle of the distribution spilled more equally into both tails of the distribution. Thus, by 1991, the shape of the income distribution for younger families without an adult worker was bimodal, with a significant peak on either side of the 1984 mode.

These findings underscore that the changing patterns of inequality associated with strong economic growth and social policy retrenchment have not been dominated by large declines in economic well-being but rather by significant

16. In Germany, both single- and dual-earner families gained from the expansion.

improvements in economic fortunes. However, they also point to the strong link between participating in the economy and benefiting from economic growth. Those individuals outside of the labor market did not share equally in the increases in economic well-being experienced by the other two groups. However, although persons living in younger non-working families at the end of the recovery were not uniformly better off than such persons at the beginning of the recovery period, in both countries the proportion of the population in this situation decreased as the economy expanded. The results from these three subgroups underscore the strong link between participating in the labor market and benefiting from economic growth.

VI. CONCLUSIONS

Consistent with previous research, this paper has shown that as the income distribution changed over the growth years of the 1980s, average income rose but so did inequality. However, as demonstrated, simple summary statistics cannot document where in the income distribution these changes took place and how these changes affected the economic well-being of different groups. Kernel density estimation provides a method by which to observe changes in the income distribution without assuming a particular functional form. Applying this technique, this paper has shown that while inequality increased in the United States between 1983 and 1989, almost all American families were economically better off in 1989 than in 1983 (the beginning of the recovery). Moreover, the largest share of the increase in income inequality over the decade of the 1980s was due to rapid but unequal income gains in the "middle" of the income distribution. On the whole, workers and older persons were better off at the end of the decade than at its beginning. The real losers in the 1980s were those persons living in younger families without an adult worker.

Comparing experiences in the United States with those in Germany reveals a similar story. For those currently and previously connected to the labor market, economic growth resulted in higher economic well-being; among those left behind, those living in younger families without an adult worker were predominant. Thus, despite the differences in social policy between the United States and Germany, some connection to the labor market was the key to benefiting from economic recovery in both countries. As in the United States, Germans without this connection did not equally benefit from economic growth.

While this paper only provides a descriptive analysis of the effects of economic growth on the income distributions in the United States and Germany, its findings suggest that even in countries committed to guaranteeing a minimum level of well-being and spreading the benefits of economic growth to all citizens, the benefits of economic expansion are likely to be unevenly distributed. Future research in this area is required to begin to gauge the short- and long-term costs of this uneven distribution.

APPENDIX

CROSS-SECTIONAL PARAMETRIC MEASURES OF INEQUALITY

Formulas Used for Computation

The Gini coefficient:

$$\text{GINI} = \left[\frac{1}{2n^2\mu}\right]\sum_{i=1}^{n}\sum_{j=1}^{n}\left|y_i - y_j\right|,$$

in which y is individual income; n is the number of individuals; and μ is mean income.

90/10 percentile point measure:

$$(Y)_{p90} / (Y)_{p10}$$

where (Y) is equivalent household income assigned to all members of the household.

NOTE: The 90/50 and 50/10 measures are calculated analogously.

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