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Changes in Permanent Income Inequality in the United States and Germany in the 1990s*

By Richard V. Burkhauser**, J. S. Butler***
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Summary

Using the Theil(1) measure of post-government income inequality and the Shorrocks R measure of income stability with data from the 1980-1996 PSID-GSOEP Equivalent File we find that income inequality dramatically increased in the western states of Germany in the 1990s, following a decade of decline in the 1980s, and the share of this inequality that is permanent increased. While income is still substantially more equally distributed in the western states of Germany than in the United States, the difference in the permanent component of inequality between the two countries has considerably narrowed in the 1990s.

1. Introduction

The emergence of mature longitudinal data sets have allowed scholars (Burkhauser and Poupore 1997; Aaberge et al. 1997) to use the Shorrocks (1978, 1981) method of disentangling permanent and transitory inequality to show not only how income inequality varies across time and country but the degree to which inequality is permanent within a country. A major surprise in this new literature is that the United States, long recognized as an outlier in terms of income inequality, is also found to have a greater share of permanent inequality.¹ In this paper we repeat the analysis in Burkhauser and Poupore (1997) for the United States and Germany but do so for a series of six-year overlapping intervals starting in 1979 and ending in 1992 for the United States and starting in 1983 and ending in 1995 for Germany. Like Burkhauser and Poupore (1997) we only look at the western states of Germany, excluding migrants from East to West Germany since 1990.²

2. Economic Conditions in the United States and Germany

The United States experienced a serious economic recession in the early years of the 1980s, but this was followed by eight years of economic growth. It was not until 1991 that a recession led to negative growth. Like the 1980s, however, this economic recession was followed by continuous economic growth for the rest of the decade.

Germany experienced a similar business cycle in the 1980s, although the German recession was less serious than that of the United States at the start of that decade. However, the 1990s were far more tumultuous for Germany, as the growth years of the 1980s and the first year following reunification were replaced by stagnation in the western states of Germany and substantially higher unemployment

rates since then. As we will show, German institutions and government interventions have been much less successful in mitigating the market forces that increase inequality caused by recession and reunification in the 1990s than they were in the growth years of the 1980s, as studied by Burkhauser and Poupore (1997).

3. Methodology

There are numerous measures of cross-sectional inequality in the literature.³ We use the Theil(1) measure in our analysis of income inequality and income stability.⁴ Using the Shorrocks R, we measure stability; that is, the ratio of inequality of permanent income to the weighted average inequality of annual income:

$$(1) \quad R = \frac{I\left(\sum_{t=1}^T y_{it}\right)}{\sum_{t=1}^T \alpha_t I(y_{i,t})}$$

where α_t is the ratio of mean income in time t to mean permanent income.⁵ If there is no transitory component to annual income, then the distribution of permanent income is the same as the average distribution of annual income. In this case the Shorrocks R equals one. However, if there is a transitory component to annual income, then the average distribution of annual income differs from the distribution of permanent income. In this case, the numerator is necessarily smaller than the denominator ($R < 1$), as long as $I(\bullet)$ is strictly convex. Thus, a Shorrocks R of 0.80 means that 80 percent of average annual inequality in the period persists over the time period.

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¹ Using an alternative measure of mobility between two-year periods, Hauser and Fabig (1998) find that mobility declines in both the eastern and western states of Germany between 1990 and 1995.

² We do this to contrast inequality before and after reunification. Data from the GSOEP is available since 1990 on the eastern states of Germany. Including those states in our measure of German inequality would substantially increase inequality in Germany since 1990. See Schwarze (1996) for an early discussion of inequality in reunified Germany. For a discussion of mobility in the eastern and western states of Germany between 1990 and 1995 see Hauser and Fabig (1998).

³ See Jenkins (1991) for a review of these measures.

⁴ In Burkhauser, Butler and Houtenville (1998) we use alternative summary inequality measures and find similar results.

⁵ For a fuller discussion of the use of the Shorrocks R in this context see Burkhauser and Poupore (1997).

Alternatively one can think of the Shorrocks R as a summary measure of mobility. If everyone's income remains the same, relative to everyone else in the distribution over time, there is no mobility and the Shorrocks R equals one. Otherwise, the Shorrocks R will reflect this mobility, although no distinction is made between upward and downward mobility.

Data

To disentangle transitory and permanent income inequality (or to capture mobility), it is necessary to follow individuals over time. The 1980-1996 Panel Study of Income Dynamics-German Socio-Economic Panel (PSID-GSOEP) Equivalent File contains comparable information on income of families and family members; consequently, inequality and mobility can be evaluated. The analysis below focuses on the individual as the unit of analysis, although information on that individual's family is also used. We look at the distribution of an individual's share of equalized post-government family income. Post-government family income, for Germany and the United States, is pre-government income plus public transfers and Social Security pensions minus total family taxes.⁶

Sample Restrictions

We draw a sample from the PSID-GSOEP Equivalent File for each country to estimate the Shorrocks R over various time periods. All samples are restricted to individuals with complete information and positive yearly incomes over the appropriate time period;⁷ no restrictions are made regarding age, gender, or position in the family for our income measure. Since we use different time periods, some individuals will be included in certain analyses and not in others. The multi-period nature of the Shorrocks measure requires persons to be in the data over the entire period of

⁶ For a fuller discussion of these variables see Burkhauser, Butrica and Daly (forthcoming) and Burkhauser and Butrica (1997).

⁷ This choice of sample criterion allows as many individuals as possible for each calculation. While each of our six-year period samples contains a somewhat different set of people, the sample restrictions are the same and hence are comparable. Alternatively, we could have drawn a sample for the entire panel (which would require individuals to be in the sample for the entire length of the panel) and then subdivided the data into periods. While this could produce a more consistent sample over time, it would also be a very restrictive one. Results using the alternative, more restrictive sample criterion yield similar patterns of inequality and mobility.

Table 1

Measures of the Level and Distribution of Post-Government Income in the United States and Germany, 1979-1995^{a)}

Year	United States							Germany						
	Mean ^{b)}	Median ^{b)}	Theil(1)	Theil(0)	Gini	90/10	n	Mean ^{c)}	Median ^{c)}	Theil(1)	Theil(0)	Gini	90/10	n
1979	20,375	18,479	0.140	0.154	0.296	4.467	18,712							
1980	19,264	17,267	0.145	0.159	0.301	4.570	18,726							
1981	18,525	16,910	0.145	0.163	0.300	4.643	18,945							
1982	18,854	16,790	0.162	0.180	0.317	5.111	19,181							
1983	19,306	17,291	0.168	0.189	0.322	5.364	19,262	28,105	25,559	0.113	0.121	0.261	3.382	15,072
1984	20,048	17,767	0.171	0.190	0.325	5.256	19,444	28,477	26,117	0.106	0.111	0.256	3.300	13,554
1985	20,343	18,048	0.174	0.195	0.327	5.425	19,268	28,633	26,233	0.099	0.104	0.248	3.202	12,922
1986	20,871	18,612	0.175	0.198	0.329	5.468	19,322	30,448	27,621	0.102	0.106	0.252	3.229	12,699
1987	21,997	19,302	0.183	0.206	0.335	5.634	19,371	30,998	28,353	0.106	0.111	0.256	3.324	12,065
1988	22,357	19,325	0.193	0.215	0.343	5.819	19,384	31,948	28,939	0.106	0.111	0.256	3.343	11,648
1989	22,396	19,340	0.194	0.215	0.344	5.916	19,637	32,782	29,538	0.107	0.111	0.257	3.292	11,428
1990	22,055	19,190	0.192	0.211	0.341	5.606	19,624	33,673	30,308	0.113	0.119	0.265	3.512	11,384
1991	21,780	18,869	0.193	0.219	0.343	5.792	20,020	34,292	31,082	0.112	0.121	0.265	3.519	11,165
1992	22,112	19,063	0.201	0.233	0.350	5.862	21,080	34,147	31,272	0.120	0.131	0.273	3.660	11,028
1993								33,615	30,321	0.123	0.134	0.276	3.662	10,772
1994								33,221	29,895	0.125	0.136	0.278	3.771	10,531
1995								33,512	30,678	0.125	0.139	0.278	3.890	10,304

^{a)} These calculations use the sample weights and oversamples. These calculations are based on all individuals with positive post-government income. However, the top 0.5 percent and bottom 0.5 percent in terms of post-government income were cut from each sample. — ^{b)} 1992 United States dollars. — ^{c)} 1992 Deutsche Mark.

Source: Authors' calculations.

the specific analysis. Because we are interested in seeing how transitory and permanent inequality has changed over time, we subdivide our data into a series of six-year overlapping intervals beginning in 1979 in the United States and beginning in 1983 in Germany.

Because the German Institute for Economic Research (DIW) has a different philosophy when it comes to cleaning its data for possible errors than has the University of Michigan PSID group, it is possible, especially in longitudinal analysis, to generate results which are quite sensitive to outliers using the GSOEP data.⁸ In preliminary work for this paper we discovered that a few observations were dramatically affecting the results. For this reason, a further restriction was imposed on our samples. For each sample, individuals were ranked according to their influence on the Shorrocks R, and the top 1 percent were dropped.⁹ This

restriction was imposed on both countries to ensure comparability.

Because of the nonlinearities in the Theil and Shorrocks measures, obtaining standard errors is a non-trivial task. Maasoumi and Trede (1997) derive standard errors for the Shorrocks R and take into account the non-linearities by

⁸ The problem outliers are greater in the GSOEP, but their presence diminishes over time. Results comparing the impact of these outliers are available upon request.

⁹ Unfortunately, calculating the exact influence (the Shorrocks R with and without the individual) is extremely C.P.U. intensive. However, we assume the variance within an individual's profile is highly correlated with an individual's influence. When the Theil(1) measure was used to calculate the Shorrocks R, outliers were identified with the $\text{var}_i[y_{it}]$. A 1 percent sample restriction was found to be large enough to capture outliers, but small enough so as not to alter the results unduly.

Table 2

The Shorrocks R and Inequality of Permanent Post-Government Income in the United States and Germany, 1979-1995

Six Year Periods	United States		Germany	
	Shorrocks R ^{a)}	Inequality ^{b)}	Shorrocks R ^{a)}	Inequality ^{b)}
1979 to 1984	0.8542 (0.003)	0.135	—	—
1980 to 1985	0.8560 (0.003)	0.140	—	—
1981 to 1986	0.8598 (0.003)	0.147	—	—
1982 to 1987	0.8607 (0.003)	0.153	—	—
1983 to 1988	0.8622 (0.004)	0.159	0.8057 (0.004)	0.086
1984 to 1989	0.8641 (0.004)	0.161	0.8040 (0.004)	0.084
1985 to 1990	0.8679 (0.004)	0.163	0.8149 (0.004)	0.085
1986 to 1991	0.8682 (0.004)	0.164	0.8214 (0.004)	0.091
1987 to 1992	0.8584 (0.004)	0.166	0.8242 (0.004)	0.091
1988 to 1993	—	—	0.8226 (0.004)	0.004
1989 to 1994	—	—	0.8267 (0.004)	0.093
1990 to 1995	—	—	0.8267 (0.004)	0.096

^{a)} The standard error of R is in parentheses. Sample sizes varied from 14,471 to 15,006 in the PSID over the periods and from 8,233 to 9,457 in the GSOEP. — ^{b)} These values are the Theil(1) measures of inequality for permanent income in the given period. They are the numerators of the Shorrocks Rs.

Source: Authors' calculations.

using the central limit theorem and the Delta method. We use a similar procedure.¹⁰

4. Results

Table 1 shows single-year measures of mean and median post-government income in the United States and Germany over the period of our analysis. It also shows single-year summary measures of income inequality in the two countries using the two Theil measures as well as the more common Gini and 90/10 ratio.¹¹

The mean and median post-government income values in this table show similar business cycle-driven patterns. The United States experienced a substantial decline in real post-government income as the economy slipped into recession in the early 1980s. Real income increased over the rest of the decade only to drop once again in the early 1990s. Our German data begin in 1983 and record yearly increases in real post-government income from 1983 through 1991, after which real income declines through 1994.

The patterns of cross-sectional income inequality for the United States and Germany in the 1980s are similar to those found in other studies (see Gottschalk and Smeeding 1997). Post-government income inequality continuously increased in the United States regardless of the summary measure used. In Germany, income inequality fell from 1983 through 1989.

The early years of the 1990s continued the pattern of increased inequality in the United States. However, unlike the 1980s, post-government income inequality rose more rapidly in Germany than in the United States and by 1995 German inequality was not only dramatically greater than its level in the year prior to reunification, but was substantially higher than in 1983, the first year of our data. While German inequality remains far below inequality in the United States, the gap narrowed in the 1990s.

The Shorrocks Measure of Mobility

The choice of period length for our Shorrocks R measure is arbitrary. In Table 2 we report values for a six-year time period.¹² This time period both allows our results to be directly compared with Burkhauser and Poupore (1997) and allows us enough sets of overlapping years to look at trends in mobility over the entire period. Shorrocks R values for the United States are contained in row 1, beginning with the period 1979 through 1984. Row 2 reports the standard error from each of these values. Row 4 contains Shorrocks R values from Germany and row 5 contains their standard errors. The permanent component of income inequality captured by the Shorrocks R in the United States is significantly and substantially higher than that of Germany for all comparative years.¹³ This finding is similar to that found by Burkhauser and Poupore (1997) for the single six year period 1983 through 1988. However, the difference in the

size of the permanent component of income inequality appears to be narrowing in the 1990s.

Rows 3 and 6 of Table 2 contain measures of inequality for permanent income for the United States and Germany respectively. The Theil(1) inequality values for post-government permanent income inequality reported in these rows come from the numerator of the Shorrocks R for the six-year intervals reported in each column.

The United States has higher levels of permanent income inequality than Germany in all comparative years. Furthermore, like our single-year measures of income inequality in Table 1, our measure of permanent income inequality trended up in the United States throughout the 1980s, although the increase was less in the later years of the decade and into the early 1990s. There was a slight dip in income inequality in Germany in the 1980s with a slight trend up in the 1990s that appears to be growing. Inequality is higher in both countries in the last years of our analysis than in the first years.

Table 3 looks more precisely at the trends in the Shorrocks R over the period of our analysis. It reports the change in the six year value of the Shorrocks R between consecutive pairs of initial years.¹⁴ As can be seen in row 1, which reports the difference in the Shorrocks R values for United States post-government income inequality for paired years over the period, there was a significant but small upward trend in the permanence of income inequality in the United States over the 1980s. Standard errors are reported in row 2. Only in the last set of paired years in the data is there an indication that this trend has ended.

¹⁰ The only difference in our procedure is that we account for the estimation of the annual weights in the denominator of the Shorrocks R, α_t . Our Gauss programs for calculating these standard errors are available upon request from the authors.

¹¹ Because we use trimmed data in our multi-period analysis, we also trim the yearly data presented here. We exclude the top and bottom 0.5 percent of each year's sample. This method excludes all the outliers found in our multi-period analysis.

¹² In Burkhauser, Butler and Houtenville (1998) we report a Shorrocks R for all possible period lengths for initial years 1979 through 1987 from the United States and for initial years 1983 through 1990 for Germany. The permanent component of inequality falls over time as more years are considered in both countries. Our results are not sensitive to time period chosen for Shorrocks R comparisons.

¹³ We use the standard error for each country's Shorrocks R for a given period to calculate the standard error for their difference. In all cases the difference in Shorrocks Rs is significant at the 1 percent level.

¹⁴ To evaluate divergence in paired years we require an individual to have positive post-government income values for all years included in the comparisons. This requires one additional year of positive values for all sample members. This slightly reduces our sample and slightly increases the Shorrocks R relative to these values in Table 2. The differences in the Shorrocks R reported in Table 3 come from these unreported Shorrocks Rs, not from those reported in Table 2.

Table 3

**Changes in the Shorrocks R
between Years for Post-Government
Income in the United States and Germany,
1979-1995^{a)}**

Six Year Period to Six Year Period	United States	Germany
1979-1984 to 1980-1985	0.0037** (0.0010)	—
1980-1985 to 1981-1986	0.0027** (0.0010)	—
1981-1986 to 1982-1987	0.0019* (0.0010)	—
1982-1987 to 1983-1988	0.0031** (0.0011)	—
1983-1988 to 1984-1989	0.0057** (0.0010)	0.0026 (0.0020)
1984-1989 to 1985-1990	0.0027** (0.0009)	0.0105** (0.0017)
1985-1990 to 1986-1991	-0.0070** (0.0011)	0.0062** (0.0016)
1986-1991 to 1987-1992	—	0.0018 (0.0016)
1987-1992 to 1988-1993	—	0.0054** (0.0018)
1988-1993 to 1989-1994	—	0.0000 (0.0017)
1989-1994 to 1990-1995	—	0.0000 (0.0016)

^{a)} The standard errors are in parentheses. Calculating a change in the six-year Shorrocks R requires seven years of data, so Shorrocks Rs used here differ slightly from those reported in Table 2. — **, * represent 0.01, and 0.05 levels of significance, respectively. Sample sizes varied from 13,782 to 14,315 in the PSID over the periods and from 7,849 to 8,872 in the GSOEP.
Source: Authors' calculations.

Row 3 reports the difference in the Shorrocks R values for German post-government income inequality for paired

years over the period. The increases in the permanence of income inequality in Germany over paired years in this period are significant and greater than those that occurred in the United States. Most of the increases occurred in the latter part of the 1980s and early 1990s. There was no change in the last two sets of paired years.¹⁵

5. Conclusions

The Shorrocks R offers a convenient method for measuring the degree of permanence in income inequality over a specific time period. Previous studies using this method have shown that not only did the United States have higher levels of inequality than Germany during the growth years of the 1980s, but that the United States also had a higher permanent share of post-government income inequality. This paper confirms these results but shows that Germany in the 1990s, buffeted by reunification and declines in economic growth, has not only experienced greater levels of post-government income inequality but has also seen the permanent component of that income inequality increase.

Using six-year overlapping intervals beginning in the early 1980s and ending in the mid-1990s, we show that while the component of post-government income inequality that is permanent in Germany is still below that in the United States, it has risen significantly over the period of our analysis and is now approaching that of the United States.

Both single-year and multi-year measures of post-government income inequality have increased in Germany in the 1990s. Since we also find that the permanent component of that inequality has also increased, we conclude that the rise in cross-sectional inequality is not caused by an increase in transitory fluctuation in income over these years but is caused by more fundamental changes in the German economy.

¹⁵ These results are consistent with those found by Hauser and Fabig (1998) using an alternative methodology.

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