

RELATIVE INEQUALITY AND POVERTY IN GERMANY  
AND THE UNITED STATES USING ALTERNATIVE  
EQUIVALENCE SCALES

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We use data from the Luxembourg Income Study to show the sensitivity of measures of relative economic well-being of persons in the U.S. and Germany using official equivalence scales and consumption-based country-specific equivalence scales developed for the two countries. Overall inequality and poverty levels are found not to be sensitive to the equivalence scale used. However, the official German equivalence scale yields quite different results from the others with respect to the relative income and poverty levels of vulnerable groups within the population, especially older single people.

Our ability to compare the economic well-being of the population of one country with another, as well as the relative well-being of sub-groups within those populations, has been greatly enhanced by the development of micro-level data in most industrialized countries. For the last decade the Luxembourg Income Study (LIS) has made such data available to researchers. Yet as our data have become richer, the methodological problems that confront researchers interested in such cross-national comparisons have become clearer but no less complex.

One such problem is how to treat persons living in households of different sizes and compositions in cross-national income distribution studies. Equivalence scales, which attempt to adjust for economies of scale within households, are an integral part of most economic well-being comparisons, and they play a major role in the allocation of transfer payments within countries. The choice of an "official" equivalence scale is controversial even when it is used solely for within-country purposes, since the choice of scale can substantially affect the size and composition of the poverty population as well as the share of resources government programs provide to it. The choice of an official equivalence scale for cross-national comparisons is even more controversial, since it must account not only

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for differences across households of size and composition but also country-specific differences.

The choice of a cross-national equivalence scale is further complicated by the fact that, unlike national equivalence scales, which at least have some anchor in official government policy, no officially designated multi-national equivalence scale exists. Yet as multi-national associations like the European Community become more integrated they will increasingly be drawn into cross-national comparisons that require an equivalence scale or scales for measurement purposes.

In this paper we compare “official” equivalence scales in the U.S. and the Federal Republic of Germany—the equivalence scales implicit in the official poverty line in the U.S. and in the major public welfare program, Social Assistance, in Germany—with a set of country-specific constant-utility-based equivalence scales developed by Merz, Gardner, Smeeding, Frick, and Johnson (1993) for the U.S. and Germany and with a single common parametric equivalence scale used by researchers in cross-national comparisons. We provide a brief description of each scale, including its overall elasticity of scale rate across household sizes. We then show the sensitivity of common measures of person level economic well-being to the choice of scale in comparisons of aggregate economic well-being and the relative economic well-being of different groups of persons in the U.S. and Germany. While aggregate comparisons of economic well-being are found not to be sensitive to the choice of equivalence scale, the relative economic well-being of groups within a country and comparisons of those groups between the two countries are quite sensitive to the choice of scale used. We are not able to determine which set of scales is most appropriate for cross-national research, but we are able to show that the official German scale provides much different results from all the others.

## 1. ALTERNATIVE EQUIVALENCE SCALES

With respect to cross-national comparisons, conventional wisdom holds that one should use an equivalence scale and then test the sensitivity of the basic results of the analysis with alternative scales (e.g. Förster, 1990; Jenkins, 1991; Atkinson, Gardiner, Vechêne, and Sutherland, 1994; Hagenaars, de Vos, and Zaidi, 1994). In their study of the U.S. and Germany, Burkhauser, Duncan, Hauser, and Berntsen (1990) use each nation’s official scale and test the sensitivity of their results by substituting the U.S. scale for the German scale and vice versa. While this is a reasonable subcomponent of the general strategy discussed above, it is an atheoretical strategy, since employing one nation’s scale on another nation’s people ignores differences in relative prices as well as in the provision of goods and services through the tax system, such as health care and education, between the two nations.

### 1.1. *Extended Linear Expenditure System Equivalence Scales*

In this paper we use an alternative strategy, a single methodology—an extended linear expenditure system (ELES)—based on country-specific data for the U.S. and Germany to estimate country-specific equivalence scales.

An ELES is based on a complete demand system approach. This estimated multiple equation expenditure system takes into account a full market basket—food, clothing, body and health care, housing, and energy—with all its interdependencies and relative prices. The scales used here were developed by Merz *et al.* (1993) and the German results are discussed more fully in Merz and Faik (1995). They follow the work of Lluch (1973) and especially Van der Gaag and Smolensky (1982). The German equivalence scale estimation is based on the German Income and Consumption Survey [Einkommens-und Verbrachsstichprobe (EVS)]. The U.S. equivalence scale estimation is based on the U.S. Consumer Expenditure Survey. These ELES scales explicitly allow for national differences in consumption weights and goods prices. While the Merz *et al.* (1993) approach results in different equivalence scales for the U.S. and Germany, the scales are based on a consistent methodology, with adjustments for differences in scale economies determined by actual consumption patterns and not by expert judgments or political considerations.<sup>1</sup>

Phipps and Garner (1994) provide a different example of a constant methodology approach by estimating equivalence scales for the U.S. and Canada using the Engle-based estimation technique employed by Statistics Canada. They find little statistical or practical difference between the resulting scales for the two nations. They use the LIS database to verify that both scales yield identical overall poverty rates for the U.S. and Canada. However, they do not compare their results to other equivalence scales and, more importantly, they do not examine how their scale affects sub-group differences in poverty rates.

## 1.2. Official Equivalence Scales

The official U.S. equivalence scale was developed by Orshansky (1965) in her attempt to determine poverty lines for different types of households in the U.S. The scale is based on the cost of providing a minimally adequate diet for households of different sizes and ages who live in different locations as calculated in 1955 by the U.S. Department of Agriculture. Based on data from the 1961 Consumer Expenditure Survey, Orshansky established that food purchases equaled one-third of total expenditures for the median income household in the U.S. She then multiplied the cost of the minimal food budget by three for each household type of size two or more to establish its poverty line (see Ruggles, 1990). These poverty thresholds were later simplified to vary solely by household size and age. In 1969 the U.S. Bureau of the Budget adopted these thresholds and the equivalence scale embedded in them for use in all official U.S. measures of poverty.

While the Orshansky equivalence scale continues to be used in all U.S. government statistics regarding poverty, its use is not without controversy. Critics argue, for instance, that the substantial variations in its scale economies across family size are unreasonable. They also argue that changes since the 1960s in the relative price of food and in the share of food expenditures in household budgets make

<sup>1</sup>While we use a consistent methodology across the two countries, the ELES scales, like all other scales developed from expenditure data, suffer from identification problems (see Pollack and Wales, 1979; Blundell and Lewbel, 1991), and hence are only suggestive of the appropriate returns to scales in the U.S. and Germany.

the official equivalence scale obsolete. They urge that more recent data be used to estimate a new equivalence scale. (For examples of this criticism see Ruggles, 1990, and most recently Citro and Michael, 1995).

Most studies of relative economic well-being and poverty in the U.S. use the equivalence scale embedded in the official U.S. poverty lines in their analysis. Furthermore, these official poverty lines are a major factor in determining eligibility for various government programs as well as for allocation of federal funds to state and local governments. We will use this official U.S. scale in our analysis.

Germany has no official poverty lines or equivalence scales. However, the German government has recognized the concept of a "socio-cultural minimum income level" (House of Representatives document 10/6055, 10) and uses its public welfare programs to prevent households from falling below that minimum. The German public welfare law (BSHG) sets forth the guidelines for determining a person's "basic needs." According to the BSHG (Section 22 BSHG as well as the accompanying statutes) benefits for dependents living in a welfare beneficiary's household are determined by a "progressive reduction" method. Hence, German public welfare benefits can be considered "poverty" thresholds, and the rules governing the level of benefits for different types of families provide an implicit equivalence scale.

Operationally, German welfare benefits are based on the concept of the cost of a "basket of goods" necessary to satisfy basic needs. As in the U.S., the expert opinion of nutritionists was used to determine the contents of a basket of food necessary for basic needs, but other goods were also included. Between 1970 and 1991, the cost of the goods in the basket were determined by average prices in the state in which the family lived. No explicit empirical analysis was used to determine the equivalence scale, however. Over this period the scale changed only once, in 1991. Since 1991, the method of adjusting the level of benefits has changed to better capture changes in the basket of goods that are considered a social minimum. The typical basket of goods purchased by a low-income worker is now used as the guideline for the social minimum basket of goods. In practice this has meant that the value of the basket has increased with increases in the net of tax hourly wage rate per employed person. Past cross-national studies of economic well-being and poverty in Germany have used this implicit equivalence scale (e.g. Hauser and Fisher, 1990; Burkhauser *et al.*, 1990; Hauser, Frick, Mueller, and Wagner, 1994; Mueller, Wagner, Frick, and Hauser, 1994). We will use this de facto German scale in our analysis.

### 1.3. *A Single International Equivalence Scale*

Researchers interested in comparative cross-national research on income distribution and poverty must choose which equivalence scale or scales to employ. Using one scale for all nations appears to be the dominant choice in the literature (e.g. Buhmann, Rainwater, Schmaus, and Smeeding, 1988; O'Higgins and Johnson, 1990; Smeeding, O'Higgins, and Rainwater, 1990; Ringen, 1991).

In these studies a class of parametric equivalence scales is often used in which the scales share a common functional form, and parametric variations change the scale rates for households of different sizes. The scale developed in Buhmann

*et al.* (1988), which has a single parameter ( $e$ ), the elasticity of the scale rate with respect to household size, is an example of this class of scale. The Buhmann *et al.* (1988) scale is characterized by the following equation:

$$(1) \quad EI = D/S^e$$

where equivalent income ( $EI$ ) equals total disposable household income ( $D$ ) divided by household size ( $S$ ) raised to the power ( $e$ ). Scale economies can be thought of as a function of ( $e$ ). At one extreme, where ( $e$ ) equals 1, no economies of scale exist and a family of two requires twice as much disposable income as a family of one to reach the same level of equivalent income. Operationally each person is assigned the per capita income of his or her household. At the other extreme, where ( $e$ ) equals 0, economies of scale are perfect so that a household of two, or for that matter a household of any number, can live exactly as well as a household of one with no increase in their disposable income. Operationally each person is assigned the income of his or her entire household.

Recent international studies on income inequality and poverty sponsored by the OECD (e.g. Förster, 1990; Atkinson, Rainwater, and Smeeding, 1995) and the Statistical Office of the European Commission (Hagenaars, de Vos, and Zaidi, 1994), and the Ruggles (1990) study of the U.S. use this type of exponential equivalence scale. The value of ( $e$ ) they chose varies slightly from 0.50 to 0.55. An ( $e$ ) in this range will yield an equivalence scale in the middle of the range of possible choices, but none of these authors provides a theoretical or behavioral justification for their choice. To represent the common international scale approach we adopt a value of ( $e$ ) equal to 0.50 and call it the International Experts scale in this paper. (See Coulter, Cowell, and Jenkins, 1992; Jenkins and Cowell, 1994, for fuller discussions of the use of parametric equivalence scales.)

#### 1.4. Comparing Equivalence Scales

Table 1 compares the equivalence scale values developed by Merz *et al.* (1993) for Germany and the U.S. with the official scales of the U.S. and Germany and the International Experts scale. The scale values are reported for household sizes of one to six. In the bottom row of Table 1, we use the Buhmann *et al.* (1988) procedure to estimate the elasticity of each of our scales with respect to household size.<sup>2</sup> The official German scale has by far the highest elasticity ( $e=0.81$ ) and hence the smallest implied scale economies. The other scales fall much closer together, with the official U.S. scale closest to the official German scale. The two ELES scales have the lowest ( $e$ ) values and hence the greatest overall economies of scale.

While the official U.S. scale is closer to the official German scale than any other scale in overall elasticity, these two official scales are substantially different. The most striking difference between the official German and U.S. scales is at the two-person level. The official U.S. scale implies considerably greater economies of scale than does the official German scale. In the U.S. it is presumed that a two-person household requires only 28 percent more income than a one-person

<sup>2</sup>To estimate our ( $e$ ) values, we empirically estimate equation (1) using OLS regressions for each of the equivalence scales with the values reported in Table 1.

TABLE 1  
ALTERNATIVE EQUIVALENCE SCALE VALUES FOR THE U.S. AND GERMANY

Number of People in Household	Official Scales		ELES Scales <sup>c</sup>		International Experts Scale <sup>d</sup>
	U.S. <sup>a</sup>	Germany <sup>b</sup>	U.S.	Germany	
1	100	100	100	100	100
2	128	181	149	148	141
3	157	244	181	173	173
4	201	308	199	189	200
5	238	371	201	198	224
6	268	435	200	193	245
Elasticity of Scale ( $e$ ) <sup>e</sup>	0.56	0.81	0.40	0.38	0.50

<sup>a</sup>Equivalence scale embedded in U.S. Bureau of the Census (1989) poverty line.

<sup>b</sup>Equivalence scale embedded in German public welfare law (BSHG) since 1991.

<sup>c</sup>Equivalence scale developed by Merz *et al.* (1993). Note that the equivalence values fall slightly between 5 and 6 persons because these are composite values of households of the same size but different family types.

<sup>d</sup>Equivalence scale developed by several analysts and used in various studies undertaken on behalf of the Office of Economic Cooperation and Development (Förster, 1990; Atkinson, Rainwater, and Smeeding, 1994), as well as the Statistical Office of the European Community (Hagenaars, de Vos, and Zaidi, 1994), and by Ruggles (1990).

<sup>e</sup>Elasticity of scale with respect to household size. Based on  $EI = D/S^e$ .

household to keep both its members at the same level of economic well-being they would have if they were living alone, while in Germany it is presumed that a two-person household requires 81 percent more income to do so. The differences in economies of scale continue at larger household sizes.

Differences in official equivalence scales of the magnitude reported in Table 1 can have important effects on measuring economic well-being. If each country uses its official scale, the income requirements of persons living in larger households relative to those living in smaller households will be reported to be consistently greater in Germany than in the U.S.

This difference in scales is likely to be particularly troublesome for studies that attempt to measure the relative economic well-being of persons living in older vs. younger headed households in the two countries. As can be seen in Table 2, the distribution of persons living in older headed households (aged 65 and over) of different sizes is much different from the distribution of persons living in younger headed households (younger than age 65).<sup>3</sup> In both the U.S. and Germany less than 10 percent of younger persons live in single-person households, while 28.5 percent of older persons in the U.S. and 35.2 percent of older persons in Germany live in single-person households. At the other end of the distribution in both the U.S. and Germany less than 10 percent of persons live in older headed households of four or more people while 51 percent of persons live in younger headed U.S. households and 47.4 percent of persons in younger headed German households that contain four or more people.

<sup>3</sup>In this paper, and in all the following tables, the unit of income sharing is the household. The unit of analysis, however, is the individual. Thus, we show how sensitive the measured economic well-being of individuals is to the equivalence scale used to assign household size-adjusted income to them.

TABLE 2  
DISTRIBUTION OF PERSONS LIVING IN YOUNGER AND OLDER HEADED HOUSEHOLDS IN THE  
U.S. AND GERMANY BY HOUSEHOLD SIZE

Number of People in Household <sup>a</sup>	U.S.		Germany	
	Distribution of Persons by Age of Head of Household			
	64 and Younger	65 and Older	64 and Younger	65 and Older
1	9.0	28.5	9.2	35.2
2	18.5	50.0	18.9	50.9
3	21.4	11.8	24.4	9.9
4	26.6	4.5	28.2	2.4
5	14.4	2.5	13.4	1.5
6 and over	10.0	2.7	5.6	0.0

*Source:* Luxembourg Income Study database versions of the 1986 U.S. Current Population Survey and the 1984 German Socio-Economic Panel.

<sup>a</sup>All related and unrelated members of a household unit sharing common living and eating arrangements.

Since people living in older headed households are more likely to live in small households, the smaller the economies of scale are, the better off older people appear to be relative to persons in younger headed households. The official German scale makes persons in older headed households appear much better off than does the U.S. scale. For comparisons between persons living in one- and two-person households, not only is the difference between the official U.S. and German scales the greatest, but the majority of older persons live in these size households.

Since the underlying assumptions are not held constant between these two scales, it is difficult to decide which—if either—is more appropriate for cross-national comparisons. Also, since the choice of scale may influence the outcome, it is difficult to distinguish between differences in the relative measured well-being of persons in older and younger headed households caused by differences in resources and those caused by inappropriate variations of the economies of scale assumed in one or both of the countries.

Compared to the large difference between the official scales of Germany and the U.S., the empirically derived ELES scales developed by Merz *et al.*, (1993) imply a much smaller difference in economies of scale between German and U.S. households. Overall, the German ELES scale has an (*e*) value of 0.38, which is slightly smaller than the U.S. ELES scale value of 0.40 and reflects slightly greater scale economies. This is in contrast to the much smaller economies of scale (0.81) implied by the official German scale relative to the official U.S. scale (0.56). However, the difference between these two ELES scales and the official scale is even more important in the household size range where the older population resides. Using the ELES scales, a two-person household in the U.S. requires 49 percent more income than a one-person household, and a similar household in Germany requires 48 percent more income. These values lie between the official equivalence scale values for the two countries, but closer to the official U.S. scale. The International Experts scale with its (*e*) value of 0.50 implies overall greater scale economies than either official scale but smaller scale economies than either

of the ELES scales. In the transition from one- to two-person households, like the ELES scales, it falls between the official scales but even closer to the official U.S. scale, with a household size of two requiring 41 percent more income than a household size of one. Below we show the sensitivity of aggregate and group well-being in Germany and the U.S. to differences in these scales.

### 1.5. *Data*

The data used in this study are taken from the Luxembourg Income Study (LIS) database. The LIS project has brought together household surveys of income for several nations and made them comparable. LIS procedures for standardizing datasets are explained in Smeeding, O'Higgins, and Rainwater (1990), and deTombeur, Milne, Warner, Gornick, and Randell (1994). Here we use the LIS database for the U.S. (1986) and Germany (1984). The U.S. survey is the same database (the Current Population Survey) on which official U.S. poverty figures are based; the German survey is taken from the German Socio-Economic Panel (GSOEP). (For a fuller discussion of the GSOEP see Wagner, Burkhauser, and Behringer, 1993.)

The income measure is the same for both nations: household disposable income—labor earnings, property income, and all government cash transfers—minus income and payroll taxes. The household definition (all related and unrelated members of a housing unit sharing common living and eating arrangements) is also the same. The income from each household record is weighted by the number of persons living in the household, thus producing measures of persons in each household. This allows us to approximate individual income in our analysis. Individuals living in households are also designated by size (single, couple only, or larger), by age of head, and by presence of children (parents living with household members aged 18 or under) or absence of children (couples without children). Single-parent households are those with only one adult (aged 19 to 64) plus children.

## 2. RESULTS

### 2.1. *The Sensitivity of Aggregate Measures of Economic Well-Being*

Table 3 shows the sensitivity of traditional aggregate measures of inequality and poverty in the two countries to the equivalence scale used. Regardless of the scale chosen, the U.S. is found to have greater inequality and higher poverty rates than Germany.

In terms of inequality rankings, regardless of whether we use the GINI, Theil ( $I_1$ ), Atkinson ( $\epsilon=0.5$ ), or the Coefficient of Variation measure of income inequality, the official German scale yields the highest level of inequality in both countries, followed by the official U.S. equivalence scale. Using the International Experts and ELES scales produces lower measured inequality in both countries. An alternative measure of inequality which looks at only two points of the distribution—the ratio of the income of the person at the 90th percentile to the income of the person at the 10th percentile—is also shown.<sup>4</sup> The pattern of results is

<sup>4</sup>For an excellent summary of the definitions of the income inequality measures used here, see Osberg (1993, Chapter 2).

TABLE 3  
AGGREGATE MEASURES OF ECONOMIC WELL-BEING FOR PERSONS IN THE U.S. AND GERMANY USING DIFFERENT EQUIVALENCE SCALES

Economic Well-Being Measure	U.S.				Germany			
	Scales							
	Official U.S. <sup>a</sup>	Official German <sup>b</sup>	International Experts <sup>c</sup>	ELES <sup>d</sup>	Official U.S. <sup>a</sup>	Official German <sup>b</sup>	International Experts <sup>c</sup>	ELES <sup>d</sup>
Gini	0.347	0.359	0.340	0.336	0.256	0.260	0.250	0.251
Theil ( $I_1$ )	0.2011	0.2085	0.1922	0.1879	0.1151	0.1219	0.1109	0.1117
Atkinson ( $\epsilon=0.5$ )	0.1040	0.1068	0.1000	0.0981	0.0544	0.0562	0.0523	0.0528
Coefficient of Variation	0.6662	0.6887	0.6467	0.6372	0.5668	0.6371	0.5621	0.5608
90/10 Ratio	6.12	6.21	5.85	5.77	3.15	3.13	3.01	3.04
Poverty Rate of Persons (in percentage)								
at 40 percent of median income	12.8	12.5	12.8	12.5	3.0	2.6	2.9	3.1
at 50 percent of median income	18.2	17.9	18.2	18.2	6.3	5.8	6.4	6.8
at 60 percent of median income	24.1	24.0	23.7	23.7	12.4	13.6	12.5	12.6
Elasticity of Scale ( $e$ ) <sup>e</sup>	0.56	0.81	0.50	0.40	0.56	0.81	0.50	0.38

*Source:* Luxembourg Income Study database version of the 1986 U.S. Current Population Survey and the 1984 German Socio-Economic Panel.

<sup>a</sup>Equivalence scale embedded in U.S. Bureau of the Census (1989) poverty line.

<sup>b</sup>Equivalence scale embedded in German public welfare law (BSHG) since 1991.

<sup>c</sup>Equivalence scale developed by several analysts and used in various studies undertaken on behalf of the Office of Economic Cooperation and Development (Förster, 1990; Atkinson, Rainwater, and Smeeding, 1994), as well as the Statistical Office of the European Community (Hagenaars, de Vos, and Zaidi, 1994), and by Ruggles (1990).

<sup>d</sup>Equivalence scale developed by Merz *et al.* (1993).

<sup>e</sup>Elasticity of scale with respect to household size. Based on  $EI = D/S^e$ .

approximately the same. Inequality is larger using the official country scales than either the International Experts or ELES scales.

It appears that the relatively low scale economies implied by both the official German and U.S. scales increase inequality relative to the International Experts and ELES scales. Although we have found differences in aggregate measures of inequality linked to the choice of scale, the magnitude of the differences is quite small. Hence, from a cross-national perspective, the differential in inequality between the U.S. and Germany is approximately the same across all scales.

Aggregate poverty rates for persons are also only slightly affected by the choice of equivalence scale.<sup>5</sup> Far more important is the point in the income distribution at which poverty is defined. When a person is declared in poverty if he or she lives in a household whose size-adjusted income is below 40 percent of the median person's household size-adjusted income—approximately the absolute poverty line in the U.S.—then the rate of poverty is calculated, depending on the scale used, as between 12.5 and 12.8 percent in the U.S. and between 2.6 and 3.1 percent in Germany. When the poverty line is raised to 60 percent of the median person's household size-adjusted income, the rates double to between 23.7 and 24.1 percent in the U.S. and quadruple to between 12.4 and 13.7 percent in Germany.

The importance of the scale elasticity on the aggregate poverty rate is best seen in Figure 1. Here we use equation (1) to show how aggregate poverty rates change as we move from perfect scale economies ( $e=0$ ) to zero scale economies ( $e=1$ ) using our data from the U.S. and Germany. In this figure, poverty is defined as 50 percent of median income, but our results hold using a 40 percent or 60 percent of median income definition. Aggregate poverty is substantially higher in the U.S. at any value of ( $e$ ). However, the value of ( $e$ ) does affect overall person-based poverty rates. We find a U-shaped relationship between poverty rate level and ( $e$ ) as discussed in Coulter, Cowell, and Jenkins (1992), although the U-shape is much more pronounced in Germany. The scale elasticity ( $e$ ) that yields the minimum U.S. poverty rate (the bottom of the U) is 0.75. The scale elasticity ( $e$ ) that yields the minimum German poverty rate is 0.70. As can be seen in Figure 1, the official German scale value is furthest from the other values and is the only elasticity value of the five discussed that is on the upper side of the U. Despite rather substantial differences in scale elasticity among our equivalence scales, aggregate measures of poverty among all persons in the U.S. and Germany using these values are not greatly affected by the researcher's choice of scale.

## 2.2. *The Sensitivity of Relative Measures of the Economic Well-Being of Vulnerable Groups*

Table 4 shows the median household size-adjusted income of persons living in vulnerable groups relative to the median person's household size-adjusted income in the U.S. and Germany. We include persons living with such groups as older people and single parents because social policy is often directly concerned with protecting their economic well-being. Here the equivalence scale chosen has

<sup>5</sup>This need not be the case. Atkinson *et al.* (1994) report that measured poverty in Great Britain relative to measured poverty in France is quite sensitive to the equivalence scale used.

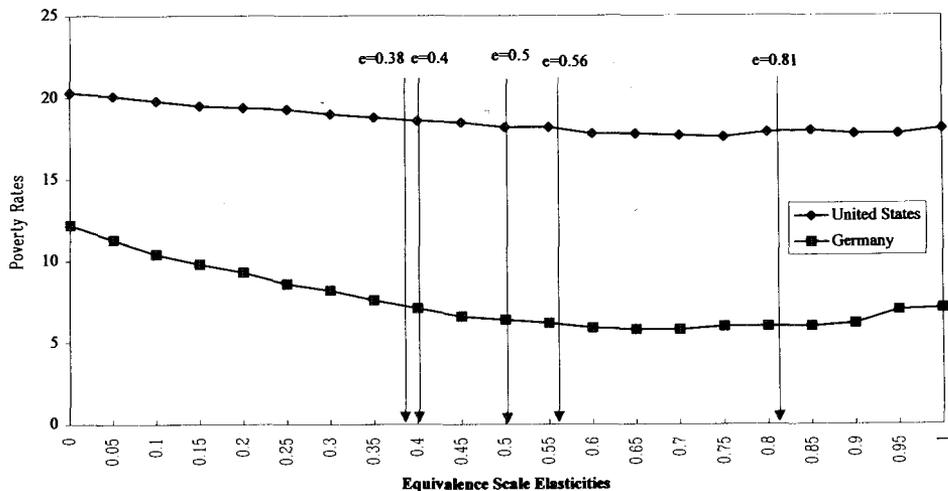


Figure 1. Sensitivity of Aggregate Person-Based Poverty Rates in Germany and the U.S. to the Choice of Equivalence Scale (poverty line equals 50 percent of the median person's household size-adjusted income)

Source: Luxembourg Income Study database version of the 1986 U.S. Current Population Survey and the 1984 German Socio-Economic Panel.

Note: The equivalence scale elasticities reported in this figure are based on the Buhmann *et al.* (1988) parametric value of scale rates for households of different sizes characterized by the equation  $EI = D/SI^e$ .

Highlighted (*e*) values in this figure correspond from lowest to highest to ELES Germany, ELES U.S., International Experts Scale, Official U.S. and Official Germany.

a much more profound effect on the outcome. Using the official U.S. equivalence scale, the median person living in a household headed by an older person in the U.S. has only 89.9 percent of the household size-adjusted income of the median person, while the median person living in a household with a younger head has 101.8 percent. In contrast, using the official German equivalence scale in Germany, the household size-adjusted income of the median person living in a household with an older head is actually slightly higher than the household size-adjusted income of the median person living in a household with a younger head (101.7 vs. 99.6 percent of the household size-adjusted income of the median person).

However, the differences reported using the official U.S. and the official German scales in their own countries has much more to do with the differences between the official equivalence scales used than with differences in the income of older and younger households. When the official German scale is used in the U.S. (column 2), a person living in the household of an older person is found to have approximately the same household size-adjusted income as the median person (98.0 percent). When the U.S. scale is used in Germany (column 6), a person living in the household of an older person is now reported to have only 88.8 percent of the median person's household size-adjusted income, approximately the same household size-adjusted income as reported for older households in the U.S. using the official U.S. scales.

Using the International Experts and ELES scales produces the quite surprising result that the median older person in the U.S. and in Germany are

TABLE 4  
 MEDIAN HOUSEHOLD SIZE-ADJUSTED INCOME OF PERSONS LIVING IN VARIOUS GROUPS RELATIVE TO THE MEDIAN PERSON IN THE U.S. AND  
 GERMANY, USING DIFFERENT EQUIVALENCE SCALES (PERCENTAGE)

Age of Head and Household Type	U.S.				Germany			
	Scales							
	Official U.S. <sup>a</sup>	Official German <sup>b</sup>	International Experts <sup>c</sup>	ELES <sup>d</sup>	Official U.S. <sup>a</sup>	Official German <sup>b</sup>	International Experts <sup>c</sup>	ELES <sup>d</sup>
Aged 65 and Older	89.9	98.0	85.0	81.4	88.8	101.7	85.4	82.1
Single	56.9	82.9	57.8	57.0	72.3	103.4	74.2	72.1
Couple	110.4	113.7	101.7	94.9	95.8	96.9	89.2	82.7
Aged 64 and Younger	101.8	100.2	102.2	102.7	102.6	99.6	102.6	104.0
All Parents	89.4	83.9	91.7	94.8	91.8	84.3	93.9	98.7
Single Parent	39.9	38.3	39.0	39.3	68.2	64.9	63.5	59.2
Two Parents	94.9	89.3	96.1	98.6	89.5	83.0	90.1	92.3
All Non-Parents	134.9	145.6	129.0	122.9	121.6	125.4	117.5	113.3

*Source:* Luxembourg Income Study database version of the 1986 U.S. Current Population Survey and the 1984 German Socio-Economic Panel.

<sup>a</sup>Equivalence scale embedded in U.S. Bureau of the Census (1989) poverty line.

<sup>b</sup>Equivalence scale embedded in German public welfare law (BSHG) since 1991.

<sup>c</sup>Equivalence scale developed by several analysts and used in various studies undertaken on behalf of the Office of Economic Cooperation and Development (Förster, 1990; Atkinson, Rainwater, and Smeeding, 1994), as well as the Statistical Office of the European Community (Hagenaars, de Vos, and Zaidi, 1994), and by Ruggles (1990).

<sup>d</sup>Equivalence scale developed by Merz *et al.* (1993).

approximately equally well-off relative to the median person in their respective countries, with approximately 85 percent of the median person's household size-adjusted income using the International Experts scale and 82 percent of the median person's household size-adjusted income using the ELES scale.

Another consequence of the substantial difference in implied economies of scale between two-person and one-person households in the official German scale and the other scales can be seen by looking at the relative economic well-being of older single people relative to older couples. Older single people in the U.S. are dramatically less well-off than the median person using the official U.S. equivalence scale, with only 56.9 percent of the median person's household-size-adjusted income. This relative value rises by less than one percentage point using either the International Experts or ELES scales but increases to 82.9 percent using the official German scale. In Germany we get a similar dramatic difference between the rosy picture painted by using the official German scale (103.4 percent of the median person) and the starker picture painted by using the other three scales (72.1 to 74.2 percent of the median person's household size-adjusted income). In fact, the official German scale implies that the median older single person is not only relatively better off than the median person, but is better off than the median person living in an older couple. This last result is the consequence of the sharp difference (shown in Table 1) in the official German scale in the one- to two-person range (181) relative to the other scales. The U.S. value of (128) yields the worst outcome for single older persons relative to older couples, but this result is relatively close to those using the other scales, all of which are in the 140 to 150 range. Clearly the official German scale measures the relative well-being of single people profoundly differently from the other scales and is the major source of the variation among different measures of the relative well-being of older people found in this table.

Differences in relative well-being of persons within younger groups are far smaller across scales. Once again the very low economies of scale in the official German scale yield different results from those using the other three scales. Younger households with children are found to be less well-off and younger households without children better off using the official German scale than using the other scales. While the relative economic well-being of single older people is profoundly influenced by the choice of equivalence scale, this is not the case with respect to single-parent households. In the U.S., the range of outcomes across scales for persons living in younger headed single-parent households is quite small, 38.3 to 39.9 of the median person's income, and in Germany it is only somewhat greater, 59.2 to 68.2.

Table 5 shows how the prevalence of poverty within vulnerable groups is influenced by the choice of equivalence scale. As was seen in Table 3, overall poverty rates are not greatly influenced by choice of scale, but small overall differences in poverty rates conceal far greater differences within vulnerable groups. Using the official U.S. equivalence scale, the incidence of poverty in the U.S. is higher among people living with older heads of households than among people living with younger heads of households (21.3 percent vs. 17.5 percent). This remains the case using the International Experts or ELES scales. Using these same scales in Germany results in similar findings, although the absolute levels

TABLE 5

MEASURES OF THE PREVALENCE OF POVERTY FOR PERSONS WITHIN VARIOUS GROUPS IN THE U.S. AND GERMANY USING DIFFERENT EQUIVALENCE SCALES (POVERTY LINE EQUALS 50 PERCENT OF THE MEDIAN PERSON'S HOUSEHOLD SIZE-ADJUSTED INCOME) (PERCENTAGE)

Age of Head and Household Type	U.S.				Germany			
	Scales							
	Official U.S. <sup>a</sup>	Official German <sup>b</sup>	International Experts <sup>c</sup>	ELES <sup>d</sup>	Official U.S. <sup>a</sup>	Official German <sup>b</sup>	International Experts <sup>c</sup>	ELES <sup>d</sup>
Overall	18.2	17.9	18.2	18.2	6.3	5.8	6.4	6.8
Aged 65 and Older <sup>e</sup>	21.3	15.5	23.6	24.8	9.0	5.6	10.3	12.9
Single	41.7	16.6	41.5	41.7	15.1	4.0	13.9	15.1
Couple	10.3	9.7	11.8	14.3	5.5	5.5	8.4	11.7
Aged 64 and Younger <sup>e</sup>	17.5	18.2	17.3	17.2	5.7	5.9	5.5	5.5
All Parents	21.1	23.2	20.5	19.7	5.6	7.7	5.0	4.4
Single Parent	58.8	59.9	61.5	63.5	27.7	30.3	34.1	37.6
Two Parents	15.6	17.4	14.3	13.4	5.6	7.7	5.1	4.0
All Non-Parents	10.9	9.1	11.5	12.6	5.8	3.6	6.2	7.0

Source: Luxembourg Income Study database version of the 1986 U.S. Current Population Survey and the 1984 German Socio-Economic Panel.

<sup>a</sup>Equivalence scale embedded in U.S. Bureau of the Census (1989) poverty line.

<sup>b</sup>Equivalence scale embedded in German public welfare law (BSHG) since 1991.

<sup>c</sup>Equivalence scale developed by several analysts and used in various studies undertaken on behalf of the Office of Economic Cooperation and Development (Förster, 1990; Atkinson, Rainwater, and Smeeding, 1994), as well as the Statistical Office of the European Community (Hagenaars, de Vos, and Zaidi, 1994), and by Ruggles (1990).

<sup>d</sup>Equivalence scale developed by Merz *et al.* (1993).

<sup>e</sup>The age categories, Aged 65 and Older and Aged 64 and Younger, are all-inclusive and hence sum to 100 percent. Subcategories within these age groups are not all-inclusive and therefore do not sum to age category totals.

of poverty are much lower for both young and old. However, when the official German measure is used in either Germany or the U.S., people living with older household heads are found to experience less poverty than those living with younger household heads. In the U.S. the poverty rates are 15.5 vs. 18.2 percent, and in Germany they are 5.6 vs. 5.9 percent.

As was the case in Table 4, the consequences of using the official German equivalence scale rather than any of the other scales can best be seen among single older people. These people have extremely high poverty rates in both the U.S. and Germany using equivalence scales other than the official German scale. When the official German scale is used, older single persons have lower poverty rates than younger people as a group, and when the official German scale is used in Germany, older single Germans are found to have lower poverty rates than any group except younger headed households without children!

Differences among younger groups across equivalence scales are less dramatic but follow the same pattern. Importantly, regardless of equivalence scale used, those living in younger headed single-parent households are most likely to live in poverty in both the U.S. and Germany. However, using the official German scale yields a higher incidence of poverty among persons living in younger headed single-parent households than the official U.S. scale. Using the International Experts and ELES scales yield even higher poverty rates.<sup>6</sup>

A more general way to see the importance of scale elasticity on the poverty rates of vulnerable groups is presented in Figure 2. Here we use equation (1) to show how the poverty rates of members of older and younger headed households change as we move from perfect scale economies ( $e=0$ ) to zero scale economies ( $e=1$ ) using our data from the U.S. and Germany. Here again, poverty is defined as 50 percent of median income and, as with Figure 1, the results also hold using a 40 percent or 60 percent of median income definition. As we saw in Table 2, older headed households are primarily made up of one or two persons and are on average smaller than younger headed households, so the choice of equivalence scale is critical to one's perspective of the relative well-being of these two age groups.

The poverty rate of persons living in older headed households is extremely sensitive to the equivalence scale choice. Old age poverty drops dramatically in both the U.S. and Germany as scale economies fall. Since persons living in younger headed households have a distribution of household sizes that mirrors the overall population, their poverty rates follow the U-shaped pattern of the aggregate population in Figure 1 and are much less sensitive to the choice of scale.<sup>7</sup> Because

<sup>6</sup>In tables available from the authors, we repeat work done in Table 5 but shift the poverty line down to 40 percent and up to 60 percent of the median person's household size-adjusted income. While the absolute size of the incidence of poverty within our age and household type cells changes, the pattern of impacts on those cells caused by changes in the equivalence scale does not. The official German scale continues to yield substantially different results from those found using the other three scales.

<sup>7</sup>Coulter, Cowell, and Jenkins (1992) show that a U-shaped curve will occur if the reduction in average income due to an increase in ( $e$ ) offsets the fall in individual income in the lower regions of the income distribution for some ( $e$ ) values but not all. For persons living in older headed households, which are dominated by small household sizes, size-adjusted household income falls less steeply than the average income household at all ( $e$ ) values from 0 to 1, but for persons living in younger headed households this is not the case and we get a U-shaped relationship.

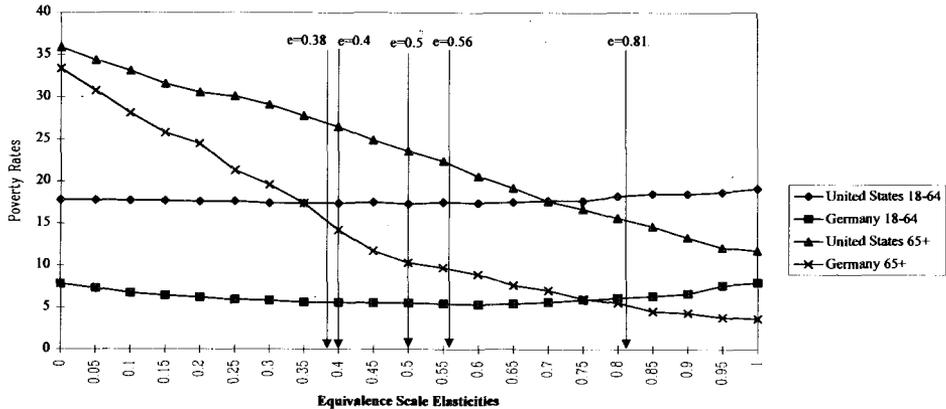


Figure 2. Sensitivity of Person-Based Poverty Rates for Members of Households Headed by Older and Younger Persons to the Choice of Equivalence Scale (poverty line equals 50 percent of the median person's household size-adjusted income)

Source: Luxembourg Income Study database version of the 1986 U.S. Current Population Survey and the 1984 German Socio-Economic Panel.

Note: The equivalence scale elasticities reported in this figure are based on the Buhmann *et al.* (1988) parametric value of scale rates for households of different sizes characterized by the equation  $EI = D/S^e$ .

Highlighted (*e*) values in this figure correspond from lowest to highest to ELES Germany, ELES U.S., International Experts Scale, Official U.S. and Official Germany.

measured economic well-being of persons living in older headed households is so much more sensitive to the equivalence scale choice than is the economic well-being of persons living in younger headed households, the poverty rate of persons living in older headed households falls below that of persons living in younger headed households at higher (*e*) values in both countries. The crossover (*e*) value in the U.S. is 0.70; it is 0.75 in Germany. As can be seen in Figure 2, the official equivalence scale for Germany is beyond the crossover point and, hence, shows persons living in older headed households to be better off than persons living in younger headed households.

Table 6 abstracts from the substantial differences in the incidence of poverty found in the U.S. and Germany and concentrates on the characteristics of the poverty populations in the two countries. It is in this table that the impact of alternative equivalence scales on the composition of the poverty population is best seen. Using the official U.S. equivalence scale, people in the U.S. living in older headed households make up 16.5 percent of the poverty population. This share rises modestly to 17.6 and 18.4 percent when the International Experts and ELES scales are used. In contrast, when the German scale is used the share of older people in poverty in the U.S. falls to 11.7 percent. Using the official German scale in Germany, people living in older headed households make up 16.5 percent of the poverty population, a percentage equal to that found in the U.S. using the U.S. scale. However, when any of the other scales is used in Germany, the share of the poverty population who live in older headed households dramatically rises to between 25.6 and 32.7 percent. Single older people make up a very small share of the poverty population using the official German scale but a much higher share

TABLE 6

MEASURES OF THE DEMOGRAPHIC CHARACTERISTICS OF THE PERSON-BASED POVERTY POPULATION IN THE U.S. AND GERMANY USING DIFFERENT EQUIVALENCE SCALES (POVERTY LINE EQUALS 50 PERCENT OF MEDIAN PERSON'S HOUSEHOLD SIZE-ADJUSTED INCOME) (PERCENTAGE)

Age of Head and Household Type	Scales							
	U.S.				Germany			
	Official U.S. <sup>a</sup>	Official German <sup>b</sup>	International Experts <sup>c</sup>	ELES <sup>d</sup>	Official U.S. <sup>a</sup>	Official German <sup>b</sup>	International Experts <sup>c</sup>	ELES <sup>d</sup>
Aged 65 and Older <sup>e</sup>	16.5	11.7	17.6	18.4	25.6	16.5	27.9	32.7
Single	8.9	3.6	8.8	8.8	14.5	4.2	13.3	13.4
Couple	3.2	3.0	3.6	4.4	6.8	7.4	10.3	13.3
Aged 64 and Younger <sup>e</sup>	83.5	88.3	82.4	81.6	74.4	83.5	72.1	67.3
Single Parent	21.1	21.9	22.1	22.7	5.6	6.7	6.9	7.1
Two Parents	30.2	34.5	27.7	25.8	27.3	40.9	24.8	18.1
Single without children	10.1	7.0	9.9	10.1	22.3	7.0	20.6	20.7
Couple without children	4.0	3.9	4.6	5.4	5.2	5.7	6.6	7.6

Source: Luxembourg Income Study database version of the 1986 U.S. Current Population Survey and the 1984 German Socio-Economic Panel.

<sup>a</sup>Equivalence scale embedded in U.S. Bureau of the Census (1989) poverty line.

<sup>b</sup>Equivalence scale embedded in German public welfare law (BSHG) since 1991.

<sup>c</sup>Equivalence scale developed by several analysts and used in various studies undertaken on behalf of the Office of Economic Cooperation and Development (Förster, 1990; Atkinson, Rainwater, and Smeeding, 1994), as well as the Statistical Office of the European Community (Hagenaars, de Vos, and Zaidi, 1994), and by Ruggles (1990).

<sup>d</sup>Equivalence scale developed by Merz *et al.* (1993).

<sup>e</sup>The age categories, Aged 65 and Older and Aged 64 and Younger, are all-inclusive and hence sum to 100 percent. Subcategories within these age groups are not all-inclusive and therefore do not sum to age category totals.

using any of the other scales. The share of older couples is much less affected by the scale used.

Among younger people the importance of scale differences is relatively unimportant in the U.S., but it is quite important in Germany. Persons living in younger headed households with children make up a substantially larger share of the poverty population in Germany using the German scale. More than 40 percent of the poverty population consists of such persons, using the German scale. In contrast, single younger people make up only 7 percent of the poverty population. These shares are substantially different using any other scale, with persons living in younger headed two-parent households making up from 18.1 to 27.3 percent using the other scales and single younger people making up from 20.6 to 22.3 percent using the other scales.

Clearly the very small economies of scale implied by the official German scale substantially increase the likelihood that members of large families, even large families with two parents, will be considered poor. In the U.S. the much larger number of people living in younger headed single-parent households dampens this outcome, but when the official German scale is used in the U.S., the share of the poverty population made up of persons living in younger headed single-parent households rises, as does the share of persons in younger headed two-parent households.<sup>8</sup>

### 3. CONCLUSIONS

The official equivalence scales used in Germany and the U.S. imply much greater differences in the economies of scale in German and U.S. households than are found using the consumption-based country-specific equivalence (ELES) scales developed for Germany and the U.S. by Merz *et al.* (1993) or the International Experts scale. The ELES scales, which are economic theory-based, are close to the International Experts cross-country equivalence scale adopted by a number of recent studies. Using LIS micro-data on the U.S. and Germany we have shown that, despite substantial differences in the economies of scale implied by these equivalence scales, measured aggregate income inequality and poverty is consistently higher in the U.S. than in Germany and this difference is not greatly affected by the choice of scale used.

However, we have also found that small differences in the aggregate mask substantial differences in the measures of relative economic well-being and incidence of poverty within vulnerable groups in these populations. Older people, especially single older people, are reported to be substantially better off using the official German equivalence scale than they are using the other three measures. The share of the measured poverty population made up of older people is also greatly reduced in both countries using the official German scale. Furthermore, virtually all of the differences in measured well-being of older persons in the U.S.

<sup>8</sup>In tables available from the authors, we repeat the work reported in Table 6 but shift the poverty line down to 40 percent and up to 60 percent of the median person's household size-adjusted income. The same patterns emerge. The official German scale implies that older people in general and those younger people living in smaller size households make up a far smaller share of the poverty population than do the other three scales.

and Germany relative to younger persons found when comparing results using each country's official equivalence scale on its people disappear when any common measure is used.

The official German equivalence scale also results in substantially lower measures of economic well-being of persons living in younger headed households with children relative to persons living in younger headed households without children, even when two parents are present. In fact, persons living in younger headed two-parent households dominate the poverty ranks using the official German scale. This is much less the case when any of the other scales is used.

These results suggest that the choice of official equivalence scale in Germany and the U.S. can substantially alter the measured composition of the poverty population and the measure of relative well-being of young and old. For researchers willing to use common and consistently estimated consumption-based equivalence scales, the differences in economies of scale implied by these official scales are greatly reduced, and the remaining country differences in the ELES scales have a much smaller impact on measured economic well-being than those implied by the official scales. Ultimately all equivalence scales require assumptions on the part of the researcher, but it is difficult to believe that the dramatic differences in equivalence scales implied by the official U.S. and German scales are real. Our research suggests that the official German scale is out of line with other measures of economies of scale for Germany or other countries.

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