EQUIVALENCE SCALES, WELL-BEING, INEQUALITY, AND POVERTY: SENSITIVITY ESTIMATES ACROSS TEN COUNTRIES USING THE LUXEMBOURG INCOME STUDY (LIS) DATABASE

BY BRIGITTE BUHMANN

Technical Director, LIS

LEE RAINWATER

Harvard University and Research Director, LIS

GUENTHER SCHMAUS

Technical Director, CEPS and Director-at-Large, LIS

TIMOTHY M. SMEEDING

Vanderbilt University and Overall Project Director, LIS

The Luxembourg Income Study (LIS) database on which this article is based offers researchers exciting new possibilities for international comparisons based on household income microdata. Among the choices the LIS microdata allows a researcher, e.g. income definition, income accounting unit, etc., is the choice of family equivalence scale, a method for estimating economic well-being by adjusting income for measurable differences in need.

The range of potential equivalence scales that can and are being used in the ten LIS countries and elsewhere to adjust incomes for size and related differences in need span a wide spectrum. The purpose of this paper is to review the available equivalence scales and to test the sensitivity of various income inequality and poverty measures to choice of equivalence scale using the LIS database. The results of our analysis indicate that choice of equivalence scale can sometimes systematically affect absolute and relative levels of poverty; and inequality and therefore rankings of countries (or population subgroups within countries). Because of these sensitivities, one must carefully consider summary statements and policy implications derived from cross-national comparisons of poverty and/or inequality.

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I. INTRODUCTION

Efforts to measure economic well-being require, among other things, some adjustment of income to take account of need. Equivalence scales are designed to accomplish this adjustment by taking into account those family characteristics deemed to affect need. Traditionally, family income per capita (or per member) has been used to adjust family incomes according to the numbers of persons in the household. But such an adjustment ignores economies of scale in household consumption related to size and other differences in needs among household members. Additional family characteristics beyond size alone which may also be taken into account include region, location, and, particularly, age of adults and age of children. In this article we consider only the most common factor, family

size, as it affects measures of poverty and inequality through various equivalence scales employed in the ten countries currently available in the Luxembourg Income Survey (LIS) database. We concentrate on size because it is always used in equivalence adjustments; because it is often the *only* factor used in equivalence scales; and finally, because it is given the greatest weight in the few scales which add other considerations.

The equivalence scales currently in use for policy purposes or discussed in the scholarly literature are extemely varied in how much weight they place on increments to family size in the calculation of need. At one extreme are discussions that ignore size in that they deal only with disposable income and make no attempt to adjust income to take size into account. At the other extreme are analyses of *per capita* income which characterize family units in terms of family income per person thereby ignoring economies of scale in producing and consuming household goods and services. Between these extremes, the range from proportional weight to no weight on size in adjusting income for need is rather evenly covered by the many equivalence scales in use. In other words, most of the possible and plausible assumptions about economies of scale in family consumption seem to be extant in policy and academic consideration of poverty and inequality issues.

This diversity of equivalence scales comes very strongly to the fore where comparative studies of economic well-being are concerned. In studies *within* a given nation, the question of choice of equivalence scale is often foreclosed by conventional usage or public policy practice. Poverty studies in the United States perforce use the poverty line equivalence scale, just as the elderly nearly always begin at age 65. Studies in other countries tend to use the scale built into their programs aimed at the low income population. But which scale to use when cross-national comparisons are the goal? And how do choices of different scales independently impact the results of the analysis? These are the questions which we seek to answer.

The next part of the paper briefly describes the Luxembourg Income Study (LIS) database upon which our estimates are based. Next, we present a choice set of over 30 different equivalence scales characterized by their elasticity with respect to family size. The remaining sections of the paper cover the effects of a selected set of these equivalence scales on cross-national measures of income inequality, poverty, and the demographic composition of the poor. The diskettes which can be found present additional data on equivalences and information on LIS.

II. Luxembourg Income Study (LIS)

Under the sponsorship of the government of Luxembourg, the LIS experiment was begun in Summer 1983. The purpose of the project was to gather in one central location, the Center for Population, Poverty and Policy Studies (C.E.P.S.) in Walferdange, Luxembourg, sophisticated microdata sets which contain comprehensive measures of income and economic well-being for a set of modern industrialized welfare states. Because of the breadth and flexibility afforded by microdata, researchers are free to make several choices of perspective:

identification of unit (family, household, etc.); measure of income; population to be studied (e.g. males, females, urban families, elderly households); or choice of equivalence scale, the issue which we address here, within the same research paper. This truly comparable microdata creates a potentially rich resource for cross-national policy research.

The LIS databank currently covers ten countries—Australia, Canada, Israel, Netherlands, Norway, Sweden, Switzerland, United Kingdom, United States, and West Germany—with data for 1979, 1981, 1982, or 1983. The basic procedure used to prepare the datasets is contained in Smeeding *et al.* [1985], which is available at reproduction and mailing cost from the LIS project center in Luxembourg. Table 1 contains an overview of these datasets: country, dataset name and size, income year, data sampling frame, and representativeness of the population.

The databases which emerge from this procedure consist of income microdata sets prepared to a common plan, based on common definitions of income sources

TABLE 1

AN OVERVIEW OF LIS DATASETS

Country	Dataset Name, Income Year and Size[1]	Population Coverage[3]	Basis of Household Sampling Frame[8]
Australia	*Income and Housing Survey*, 1981-82 (17,000)	97.5[4]	Dicennial Census
Canada	*Survey of Consumer Finances* 1981 (37,900)	97.5[4]	Dicennial Census
Germany	*Transfer Survey*, 1981[2] (2,800)	91.5[7]	Electoral Register and Census
Israel	*Family Expenditure Survey*, 1979 (2,300)	89.0[5]	Electoral Register
Netherlands	*Survey of Income & Program Users*, 1983 (4,833)	99.2[4]	Address Register of The Postal and Telephone Companies
Norway	*Norwegian Tax Files*, 1979 (10,400)	98.5[4]	Tax Records
Sweden	*Swedish Income Distribution Survey*, 1981 (9,600)	98.0[4]	Population Register
Switzerland	*Income and Wealth, Survey*, 1982, (7,036)	95.5[9]	Electoral Register and Central Register for Foreigners
U.K.	*Family Expenditure Survey*,[2] 1979 (6,800)	96.5[6]	Electoral Register
U.S.A.	*Current Population Survey*, 1979 (65,000)	97.5[4]	Dicennial Census

[1]Dataset size is the number of actual household units surveyed.

[2]The U.K. and German surveys collect subannual income data which is normalized to annual income levels.

[3]As a percent of total national population.

[4]Excludes institutionalized and homeless populations. Also some far northern rural residents (Inuits, Eskimos, Laps, etc.) may be undersampled.

[5]Excludes rural population (those living in places of 2,000 or less), institutionalized, homeless, people in kibbutzum and guest workers.

[6]Excludes those not on the Electoral Register, the homeless, and the institionalized.

[7]Excludes foreign-born heads of households, the institutionalized, and the homeless.

[8]Sampling Frame indicates the overall base from which the relevant household population sample was drawn. Actual sample may be drawn on a stratified probability basis, e.g. by area or age.

[9]Excludes nonresident foreigners but includes foreign residents and the institutionalized.

(including several sources of taxes and transfers) and family and household characteristics. This resource is proving itself useful in both basic and applied social and economic research concerned with issues such as:

1. The distribution of household income and the relative income positions of the old and the young; urban and rural residents; and other groups of policy interest, e.g. single parents.

2. The distribution of earnings for both men and women, and their change over the worker's lifecycle, including the transition to retirement.

3. Comparative studies of the workings of the welfare state and its policies towards the poor, single parents, the elderly, the disabled, and the unemployed.

Already the LIS database has been used to study income poverty, the relative economic status of one parent families and of the elderly, and the overall distribution of government cash transfers vs. direct taxes (Smeeding, O'Higgins, and Rainwater [1988]; Smeeding, Torrey, and Rein [1988]).

Through funding initially from the Government of Luxembourg and from the Ford Foundation, and, subsequently, through an international jointly financed consortium of science foundations from member countries, LIS has now moved beyond the initial experimental stage to provide a databank which can be perpetually updated and expanded to include the most recent data available for any and all nations with high quality income microdata sets which choose to participate. Additional country datasets from Finland, France, Luxembourg and Italy are expected to be added to LIS over the next two years. Plans to expand to include Poland, Japan, Hungary, and other countries are in the planning stages. The entire LIS data set will be updated during 1988 at which time income year 1985 and 1986 datasets will be added for all current LIS countries and those listed above.

The LIS project and data set is permanently housed at the CEPS Research Center in Luxembourg. Privacy and confidentiality promises to LIS country statistical agencies prohibit public use datafiles for general distribution. All users must sign a pledge not to violate the privacy and confidentiality of country datasets and the respondents to these surveys.

Facilities for room and board and several project offices are available for prospective visiting researchers at LIS. Those wishing to use the dataset can, however, access LIS easily via an acedemic remote telecommunications network. Researchers connected to the EARN/BITNET telecommunications network can send properly formated SPSSX data requests directly to Luxembourg where the technical staff will review and process the data which can then be sent back to the user using the same network. This allows easy access at reasonable speed (2-3 days) and zero direct cost. The EARN/BITNET network is an international inter-university telecommunications network. Any university with an IBM or VAX mainframe computer can become a BITNET node. The mainframe stores messages and output until the receiver retrieves them. The CEPS-LIS project center is one of these nodes, as are most major European and U.S. universities. The EARN/BITNET addresses for Buhmann and Schmaus (and the CEPS-LIS project center) and for Rainwater and Smeeding are: Buhman, SSLISBB@LUX-CEP11; Rainwater, LR@HARVUNXT; Schmaus, UCEPSOI@BLIULG11; Smeeding, SMEEDITM@VUCTRVAX.

The diskettes which accompany this article include a large number of the elements of the LIS User Package which allow a researcher to access LIS using EARN/BITNET. In addition to this information, but precluded by diskette limitations for this journal is a *LIS Sample Datafile* containing a random sample of about 200 records from each country. This sample is used to test data runs to ensure computer software commands and correct specifications. It can be obtained at cost (about $10.00) along with the LIS Information Guide by writing to the LIS research center.

III. A Potpourri of Equivalence Scales

Concern with equivalence scale issues has led the authors to undertake an informal survey of equivalence scales in use in different countries. We have used the results of that effort to show in Table 2 a representative range of scales, ordered according to how great the adjustment for family size is in the range from no adjustment to *per capita* adjustment.

The scales we have assembled can be represented quite well by a single parameter, the family size elasticity of need. We assume that economic well-being (W) or "adjusted" income, can be equated to disposable income (D) and size (S) in the following way:

$$W = D/S^e. \tag{1}$$

The equivalence elasticity, e, varies between 0 and 1; the larger it is the smaller are the economies of scale assumed by the equivalence scale. A few of the scales, particularly those based on regression analysis of survey data, specify this power relation. But, most scales do not undertake to fit this kind of mathematical relation. Some state a simple rule of thumb—e.g. additional adults after the first have weights of 0.7; additional children 0.5 Others incorporate diminishing weights for each additional person. Some scales are phrased in terms of age, rather than the number, of children. Despite these differences, equation (1) summarizes quite well the power relation they specify between need and size.

Equivalence scales generally are presented as income amounts, or ratios of amounts, needed by families of different size and/or structure. Thus, if a one person family needs one unit of income to maintain a given level of living, a two person family is said to need 1.7 units, a three person family 2.2 units, etc. As is apparent from Table 2, however, the specific amounts or ratios in the equivalence scales can be very closely approximated by a single parameter—the power to which family size is raised to index need. The correlations of scales with the log of family size (final column, Table 2) are all very close to one. While some scales also involve variations in need by age of family members and by family structure (one parent, two parent), when converted to simple scales by family size, or so much per adult and per child, the scale values fit the power relation very closely. One would have to have strong evidence, indeed, to justify paying attention to the residuals from the linear relation as shown in Table 2.

Existing equivalence scales cover almost all of the range between the extreme elasticities of 0 and 1. Among those we present in Table 2 the range is from 0.12 for a scale developed from the van Praag Income Evaluation Question (IEQ) in

TABLE 2

FAMILY SIZE EXPONENTS IN 34 EQUIVALENCE SCALES

Line	Type of Scale	Value of e Survey Scales, Expert Scales SUBJ	CONS	PROG	STAT	Correlation with Ln (Size)
A. Individual Scales						
1.	Unadjusted Family Income					na
2.	IEQ—France	0.12				1.00
3.	IEQ—Belgium	0.17				1.00
4.	IEQ—United Kingdom	0.18				1.00
5.	MIQ—U.S. Dubnoff data	0.18				
6.	MIQ—U.S. ISDP	0.21				1.00
7.	IEQ—Netherlands	0.22				1.00
8.	Necessities—U.S. 1960-61		0.23			1.00
9.	MIQ—U.S. Gallup	0.23				
10.	IEQ Switzerland	0.26				1.00
11.	IEQ Germany	0.27				1.00
12.	IEQ Denmark	0.27				0.98
13.	IEQ corrected—Netherlands	0.29				
14.	IEQ—Ireland	0.32				1.00
15.	PIE—U.S.	0.33				1.00
16.	Dutch Poverty			0.35		0.98
17.	MIQ corrected—Netherlands	0.36				1.00
18.	Expenditures—U.S. 1960-61		0.37			0.95
19.	Expenditures—U.S. 1972-73		0.38			0.99
20.	Food—U.S. 1960-61		0.47			1.00
21.	Swedish Poverty			0.54		1.00
22.	Australian Poverty			0.55		1.00
23.	Swiss Poverty			0.56		1.00
24.	U.S. Official Poverty			0.56		0.98
25.	Canadian Official LICOs			0.56		1.00
26.	Expenditures—Switzerland		0.57			0.98
27.	British Poverty			0.59		0.99
28.	German Poverty			0.67		1.00
29.	European Poverty Line 3, LIS				0.70	1.00
30.	Jenkins/O'Higgins				0.72	1.00
31.	U.S. Bureau of Labor Statistics				0.72	1.00
32.	OECD Poverty Line				0.73	1.00
33.	European Poverty Line 1				0.84	1.00
34.	*Per Capita* Consumption				1.00	1.00
B. Summary Statistics:						
Minimum Value		0.12	0.23	0.35	0.70	
Maximum Value		0.36	0.57	0.67	0.84	
Median Value		0.24	0.40	0.51	0.77	
Mean Value		0.24	0.40	0.55	0.74	

Notes:
IEQ—Income Evaluation Question
MIQ—Minimum Income Question
PIE—Public Income Evaluation
Sources by Line:
2, 3, 4, 10, 11, 12, 14: Van Praag, Hagenaars and van Weeren [1982]
5: Rainwater [1987]
6: Danziger, Van der Gaag, Taussig, and Smolensky [1984]
8, 20: Watts [1967]
9, 15: Rainwater [1974]
7, 13, 16, 17: Kapteyn, Kooreman, and Willense [1987]
25: Statistics Canada [1987]

France to 0.84 for the equivalence scale used in the first European Poverty Programme report.

We can identify two types of scales developed using experts' general knowledge, and two types developed empirically from analysis of survey data. Expert scales are developed by social science analysts using a variety of materials. Usually the developers are being responsive to considerations of policy and precedent. These may be scaled explicitly asserting how need varies by family size as in the U.S. Poverty Line or implicitly doing so by establishing amounts payable by a transfer program as in the Supplementary Benefits scheme (and associated housing supplements) in the United Kingdom. Two somewhat different goals of expert scales are therefore apparent:

(1) *Expert Statistical (STAT)*
In this case the scales are developed only for statistical purposes—that is, in order to count persons below or above a given standard of living—minimum adequacy, for example. The Bureau of Labor Statistics family budgets are a good example, or the scales used by OECD or the European community to count the low income population.

(2) *Expert Program (PROG)*
The second type of expert scale is focused on defining benefits for social programs—the Supplementary Benefits scale, or the Swedish "base amount" are examples of scales use to calculate benefits under social protection programs. The U.S. poverty line was initially developed for statistical purposes but over the years had come to serve also as a guide to the adequacy of program benefits.

Survey-based scales present a second general approach. These employ multivariate analyses of either consumption expenditures or respondents' assessment of the adequacy of income in terms of some particular target (making ends meet, not being poor, having a very good income, etc.).

(3) *Consumption (CONS)*
In this case the effort is to measure utility indirectly through the revealed preferences of consumer spending constrained by disposable income. The equivalence scales contained in the 1982 article in this journal by Van der Gaag and Smolensky [1982] which are shown in Line 19 of Table 2 are of this variety.

(4) *Subjective (SUBJ)*
Here the goal is to measure directly the utility associated with particular income levels for families of given characteristics. Different questions

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18, 31: Lazear and Michael [1980]
19: Van der Gaag and Smolensky [1982]
21: Wahlstrom [1987]
22: Henderson [1975]
23, 26: Buhmann [1988]
24: U.S. Bureau of the Census [1987]
27: Ramprakash [1986]
28: Dobroschke-Kohn [1987]
30, 32, 33: Jenkins and O'Higgins [1987]
29: Hauser and Nouvertne [1980]; also used in initial LIS research papers, see Smeeding, O'Higgins, Rainwater [1988]

related to evaluation of own income (IEQ), to minimum income needed by others to get along (MIQ) or what money buys (PIE) are used to elicit these scales.

Table 2 suggests that these kinds of scales tend to populate different regions in the continuum from a size elasticity of zero to one. The expert scales have the highest elasticities—averaging 0.74 for the ones we call statistical, and 0.55 for the program oriented ones. The consumer expenditure scales are centered in the high 0.30s. The subjective scales average around 0.25. In order to explore how much difference these varying definitions of need make for cross-national income comparisons, we will examine four different size elasticities selected to represent the range of scales. Each one is named after the type of scale most often associated with elasticities in a given segment of the zero to one range:

SUBJ—a scale with an elasticity of 0.25
CONS—a scale with an elasticity of 0.36
PROG—a scale with an elasticity of 0.55
STAT—a scale with an elasticity of 0.72

IV. The Effects of Income and Size on the Distribution of Well-Being

A country's distribution of well-being measured by income adjusted by one of our scales, is a product of its distribution of disposable income, its distribution of family size, and the degree to which the two are correlated. The problem is tractable if dealt with in logarithmic form. Table 3 reports the standard deviations of the logarithm of the relevant original variables—disposable income and family size—and of income adjusted by each of the four scales. The table also gives the correlation between the logs of income and size since, as will be shown below,

TABLE 3

Standard Deviations of Log of Disposable Income (D) and Log of Family Size (S), Their Correlation (rDS), Standard Deviations of Well-Being (W) Using Difference Equivalence Scales, and of *Per Capita* Disposable Income (PERCAP)

	Standard Deviations		Correlation	Standard Deviations of W, where W is measured using				
	D	S	rDS	SUBJ	CONS	PROG	STAT	PERCAP
Australia	0.719	0.536	0.434	0.672	0.659	0.648	0.652	0.686
Canada	0.664	0.531	0.449	0.616	0.603	0.593	0.599	0.637
Germany	0.566	0.527	0.534	0.508	0.492	0.479	0.485	0.529
Israel	0.574	0.567	0.339	0.543	0.540	0.553	0.581	0.657
Netherlands	0.613	0.480	0.231	0.597	0.597	0.609	0.631	0.686
Norway	0.558	0.556	0.595	0.488	0.468	0.449	0.454	0.501
Sweden	0.545	0.568	0.667	0.462	0.436	0.409	0.408	0.454
Switzerland	0.620	0.595	0.484	0.563	0.549	0.543	0.558	0.618
U.K.	0.608	0.513	0.586	0.543	0.522	0.498	0.493	0.517
U.S.A.	0.772	0.563	0.394	0.728	0.717	0.710	0.717	0.755

Source: LIS database

it is an important factor in determining the relation between income and any of the well-being measures.[1]

The standard deviation (sd) of the logarithm of any well-being measure (W) which adjusts disposable income (D) by an equivalence elasticity (e) according to the equation in (1) above, is determined by the standard deviations of the logs of disposable income and family size (S) and their correlation (rDS).

$$sdW = (sdD^2 + (sdS^2)(e^2) - 2e(rDs)(sdD)(sdS))^{05}. \quad (2)$$

The larger is e, the more the variance of well-being reflects the variance of family size, although this is moderated by the negative effect of the correlation between income and size.

The rank order of sdW (Table 3) for the ten LIS countries is almost the same for each equivalence scale. Israel and The Netherlands behave differently from the other countries—increasing values of e result in a higher variance of well-being than of disposable income—while in the other countries the variance of well-being is lower than that of income for all size elasticities. The variance of well-being is usually lowest at an e of around 0.5. Israel and The Netherlands have the lowest correlations between income and size; therefore, in those countries, the variance of well-being either does not decrease as fast as in other countries within increases in e, or rises faster at higher values of e. In short, using different equivalence scales does not produce very different pictures of the inequality ranking of countries when inequality is indexed by the variance of the logarithm of well-being.

What of the effect of different equivalence scales on the relative position of persons within each country? How much do individuals' positions in the distribution change when disposable income is adjusted by different equivalence scales? Table 4 presents the correlations of the logs of income and well-being measures in each of the LIS countries.

We indicated above in equation (2) that the standard deviation (sd) and variance (v) of any logged well-being measure can be calculated from the standard deviations of income (D) and size (S) and their correlation (rDS). It is also the case that the correlation of any two well-being measures can be calculated from the same three items. The covariance (cv) of any two well-being measures (W1 and W2) is a function of these three and of the two values of size elasticity (e1 and e2):

$$cvW1W2 = vD + (e1*e2)vS - rDS((vD*vS)^{0.5})(e1+e2). \quad (3)$$

The correlation of W1 and W2 is, of course, equal to the covariance divided by the square root of the product of the two variances, each of which can be

[1]All statistical results reported in this article are based on calculations weighted by persons in the family. For more on person vs. household weighting, see Danziger and Taussig [1979]. This paper is based on a family income definition which includes all persons related by blood, marriage or adoption who share the same living arrangements. While small differences in this definition are found in the Scandinavian countries (Norway, Sweden), they are not large enough to influence the results of this paper.

calculated using (2). In general, the lower the correlation between size and income, the higher will be the correlation between any two well-being measures.[2]

Choice of equivalence scale has much more effect on where individuals appear in the distribution in some countries than in others. This is particularly apparent when one considers the extremes of the correlation of disposable income and *per capita* income. Note in Table 4 that the correlation between these two (logged) variables ranges from a high of 0.732 in The Netherlands to a low of 0.365 in Sweden.

But any reasonable adjustment of income for size increases these correlations sharply. Comparing our two extreme scales, STAT and SUBJ, we find the correlations ranging from 0.819 in Sweden to 0.934 in The Netherlands (Table 4). With adjacent scales the lowest correlation is 0.974. This suggests that fine tuning of equivalence scales is not particularly important to the results. Rather

TABLE 4

CORRELATIONS AMONG LOG OF DISPOSABLE INCOME (D), LOG OF WELL-BEING MEASURES (W) AND LOG OF *PER CAPITA* INCOME

	Disposable Income (D) with					W measured by SUBJ with			
Country	SUBJ	CONS	PROG	STAT	PERC	CONS	PROG	STAT	PERC
Australia	0.984	0.965	0.912	0.846	0.709	0.996	0.971	0.928	0.825
Canada	0.981	0.959	0.898	0.821	0.668	0.996	0.966	0.916	0.799
Germany	0.976	0.945	0.859	0.749	0.538	0.994	0.950	0.876	0.710
Israel	0.969	0.935	0.847	0.750	0.582	0.993	0.952	0.890	0.764
Netherlands	0.981	0.960	0.907	0.846	0.732	0.996	0.972	0.934	0.851
Norway	0.974	0.939	0.837	0.706	0.454	0.993	0.940	0.849	0.645
Sweden	0.973	0.937	0.822	0.666	0.365	0.992	0.931	0.819	0.568
Switzerland	0.973	0.940	0.850	0.740	0.538	0.993	0.949	0.876	0.718
U.K.	0.981	0.958	0.888	0.795	0.595	0.995	0.960	0.896	0.738
U.S.A	0.984	0.966	0.916	0.855	0.729	0.996	0.973	0.933	0.839

	W measured by CONS with			W measured by PROG with		W measured by STAT with
Country	PROG	STAT	PERC	STAT	PERC	PERC
Australia	0.988	0.957	0.870	0.990	0.936	0.976
Canada	0.986	0.949	0.851	0.989	0.927	0.973
Germany	0.979	0.925	0.784	0.983	0.894	0.961
Israel	0.981	0.936	0.833	0.987	0.925	0.974
Netherlands	0.989	0.962	0.894	0.992	0.951	0.983
Norway	0.974	0.906	0.732	0.978	0.867	0.952
Sweden	0.969	0.885	0.667	0.972	0.830	0.938
Switzerland	0.979	0.925	0.793	0.983	0.901	0.965
U.K.	0.983	0.935	0.800	0.985	0.897	0.961
U.S.A	0.989	0.960	0.882	0.991	0.942	0.978

Source: LIS database

[2]We can also note that the correlation of any variable (X) with a well-being measure can be calculated once one knows the variance of the variable and its covariances (cv) with income (D) and size (S). The covariance of X with a well-being measure is:

$$cvXW = cvXD - (e) \cdot cv(XS)$$

the important issues have to do with whether a scale is in the high, middle or low part of the 0 to 1 range. In the balance of the paper we will compare distributions and low income populations in the ten LIS countries using these four scales. Additional data presenting opportunities for alternative comparisons are included in the accompanying data diskettes.

V. The Effect of Equivalence Scales on Inequality Measures in the LIS Countries

We measure inequality with four well-known and widely used measures:

(1) the Atkinson inequality index
(2) the Gini coefficient
(3) the Theil inequality index
(4) the coefficient of variation.

They all belong to the group of relative inequality measures, and are therefore not sensitive to relative changes in the income scale. But, as indicated by Atkinson [1970], Sen [1973], and Luethi [1981], they all imply some *a priori* value judgments about the distribution itself. For instance, the Atkinson index is sensitive to inequality changes in the lowest part of the income distribution; the Gini coefficient is very sensitive to inequality changes around the median; and the Theil index and coefficient of variation are very sensitive to changes at the top part of the income distribution.

According to these sensitivities (and hence the implied value judgments), the chosen inequality measures do not all indicate the same inequality difference between two distributions. As long as the Lorenz curves of the distributions do not intersect, they all provide the same qualitative indicator of the direction of inequality change (i.e., increased or decreased). But in the case of crossing Lorenz curves, these one dimensional measures can even differ in their inferences about the direction of the change in inequality between two distributions. This quasi ordering characteristic of inequality (Sen [1973]) produces the result that all statements about inequality differences, measured by one-dimensional indices, have to be confirmed by a test of non-intersecting Lorenz curves.

The income (or well-being) definitions compared here are the same as those used in the earlier tables: unadjusted disposable income (D) and D adjusted by each of our four equivalence scales: SUBJ, CONS, PROG. and STAT. Due to computer capacity limitations in computing the five inequality measures, we were forced to rely on grouped data. In so doing and in order to facilitate comparison, we have categorized disposable income and the four well-being measures in each country as a proportion of the median of disposable income and of the relevant well-being measure. Since the calculations were weighted by persons, these medians are to be understood as the median disposable income or well-being of all persons in the sample.[3]

[3]Each of the five variables was transformed as a percent of the relevant median. All negative values were recoded to −1; values higher than 800 percent of the median were recoded to 800. These transformed variables were used for the analysis of inequality measures reported in this section. For the analysis of poverty lines, rates and gaps reported in the following sections the variables were recoded into the following 22 categories: (1) low thru 10; (2) 10 thru 20; (3) 20 thru 30; (4) 30 thru 35; (5) 35 thru 40; (6) 40 thru 45; (7) 45 thru 50; (8) 50 thru 55; (9) 55 thru 60; (10) 60 thru 65; (11)

First we want to examine the income distributions, according to the inequality parameter rank order of the countries, using different inequality measures but only one income concept. Table 5 uses the Atkinson index ($e = 0.8$, and $e = 0.5$), the Gini coefficient, the Theil index and the coefficient of variation for unadjusted disposable income (D) to generate the rank ordering (RO) of each country by each measure, including medians of the RO itself.

According to the Atkinson index ($e = 0.8$), which is very sensitive at the lowest end of the distribution, D has the highest inequality in the U.S.A., followed by The Netherlands and Australia. The most equally distributed Ds are found in Sweden and in Norway. Adapting other inequality measures, the rank order of the countries remain fairly stable, with two exceptions. The Gini coefficient shows more (relative) equality for The Netherlands than the other measures and the coefficient of variation indicates a very unequal income distribution for Switzerland. According to the sensitivity characteristics of these indices one can deduce that the distribution of income in The Netherlands is relatively equal in the middle ranges, compared to the lower and higher ranges; and the distribution of income in Switzerland is very unequal at the top end of the distribution, compared with the middle and lower income ranges. Of course, because of changes in the rank order for The Netherlands and Switzerland, the ranks of the other countries are also slightly affected by these measures.

In Table 6 the Lorenz curves for these income distributions are compared. As one can see, the majority of the Lorenz curves do intersect. Theoretically, in

TABLE 5

INEQUALITY MEASURES (×1000) FOR DISPOSABLE INCOME (D), WEIGHTED BY PERSONS AND RANK ORDER (RO) FOR EACH MEASURE

Country	Atkinson 0.8 (RO)	Atkinson 0.5 (RO)	Gini (RO)	Theil (RO)	Coefficient of Variation (RO)	Median (RO)
Israel	114 (7)	71 (7)	292 (6)	142 (7)	564 (7)	(7)
Germany	106 (8)	66 (8)	280 (8)	134 (8)	556 (8)	(8)
U.K.	128 (6)	78 (6)	303 (4)	153 (6)	574 (5)	(6)
Norway	105 (9)	60 (9)	255 (10)	114 (9)	484 (9)	(9)
Sweden	104 (10)	60 (9)	264 (9)	114 (9)	474 (10)	(10)
Canada	144 (4)	83 (3)	306 (3)	157 (4)	569 (6)	(4)
U.S.A.	186 (1)	99 (1)	330 (1)	182 (1)	600 (2)	(1)
Switzerland	143 (5)	79 (5)	292 (6)	154 (5)	603 (1)	(5)
Australia	151 (2)	87 (2)	314 (2)	165 (2)	584 (4)	(2)
Netherlands	151 (2)	83 (3)	302 (5)	159 (3)	596 (3)	(3)

Source: LIS database

Method: Each inequality measure was applied to each country's disposable income (D) to arrive at an inequality score. The scores were multiplied by 1,000 and ranked from highest (1) to lowest (10).

65 thru 70; (12) 70 thru 80; (13) 80 thru 90; (14) 90 thru 100; (15) 100 thru 110; (16) 110 thru 120; (17) 120 thru 130; (18) 130 thru 150; (19) 150 thru 200; (20) 200 thru 300; (21) 300 thru 500; (22) 500 thru highest (800). The result of this grouping was to change the measured Gini only slightly (see Appendix Table 1). Only in Germany (and to lesser extent, in Switzerland) does one find a dramatic decrease of the Gini coefficient through the grouping. This is probably caused by some very high incomes in the original distribution which were reduced by our highest value grouping limit of 800. This same grouping procedure was used to generate the e values in Table 2.

TABLE 6

TEST FOR INTERSECTING LORENZ CURVES: SIZE DISTRIBUTION OF DISPOSABLE INCOME (D)

Country	ISR	GER	U.K.	NOR	SWE	CAN	U.S.A.	CH	AUS	NL
Israel	—	—	—	—	—	—	—	—	—	—
Germany	LOW	—	—	—	—	—	—	—	—	—
U.K.	.	X	—	—	—	—	—	—	—	—
Norway	LOW	X	LOW	—	—	—	—	—	—	—
Sweden	LOW	LOW	.	X	—	—	—	—	—	—
Canada	TOP	X	X	LOW	.	—	—	—	—	—
U.S.A.	.	X	TOP	TOP	.	TOP	—	—	—	—
Switzerland	.	X	X	.	.	X	X	—	—	—
Australia	TOP	X	TOP	LOW	LOW	L+T	TOP	X	—	—
Netherlands	X	LOW	T+L	X	.	X	T	T+L	T+L	—

Source: LIS database

Notes:

X = Crossing Lorenz curves in the middle and other ranges.
LOW = Crossing the low ranges of the distribution.
TOP = Crossing the upper ranges of the distribution.
T+L = Crossing the lower and upper ranges of the distribution.

all cases, where the Lorenz curves do intersect, one can make no generalized statement about overall inequality with a one dimensional inequality measure. In such cases, additional multidimensional inequality measures (like decile-analysis or additional tests to determine exactly where the Lorenz curves intersect) have to be employed to judge inequality rankings. But Table 6 also indicates that many Lorenz curves only intersect at the very bottom or the very top end of the distribution. In such situations one might still want to make conclusive statements using the Gini or the Atkinson measure, especially if one wants to refer only to the opposite end of the distribution, where the curves do not intersect.

Next we turn to the effect of the different equivalence scales on measured inequality. First we look only at the rank ordering of inequality scores for equivalence adjusted D. Table 7 shows the median ranking of the adjusted incomes using each of the five different inequality measures for each adjusted income concept (see methods statement at bottom of Table 7). The median of these medians is shown in the far right column. Again, we find a fairly stable picture across countries and rankings. For the U.S.A., the country with the highest inequality rank and for Sweden, Norway and Germany, the countries with the lowest inequality rankings, the medians of the inequality ranks are identical for all five equivalences. The U.K. has only one exception, for unadjusted disposable income, D, where the inequality is one rank order lower than for the other income definitions. But we find a much larger variance for Australia and Israel. Israel varies from rank 7 to rank 2 and Australia from rank 2 to rank 5. These extreme variations are most likely explained by the very large family sizes in Israel in particular, and also in Australia. In Israel, the average family size is more than one person per family higher than in all the other countries. Because of the varying weight attached to larger family sizes by the different equivalences as expressed by the e parameter, families may be systematically moved up and down the adjusted distribution according to family size. The various inequality measures

TABLE 7

RANK ORDERINGS (RO) OF MEDIAN DISPOSABLE INCOME (D) AND MEDIAN RO OF THE FIVE INEQUALITY MEASURES APPLIED TO ADJUSTED DISPOSABLE INCOME USING EACH EQUIVALENCE SCALE

Country	D	SUBJ	CONS	PROG	STAT	MEDIAN RO
Israel	7	5	3	2	2	3
Germany	8	8	8	8	8	8
U.K.	6	7	7	7	7	7
Norway	9	9	9	9	9	9
Sweden	10	10	10	10	10	10
Canada	4	4	5	5	5	5
U.S.A.	1	1	1	1	1	1
Switzerland	5	5	6	5	4	5
Australia	2	3	3	4	5	3
Netherlands	3	2	2	3	3	3

Source: LIS database

Methods: For each country disposable income was adjusted using one of the four equivalence scales (SUBJ, CONS, PROG, STAT). Next each of the five inequality measures was used to generate an inequality score for each measure of adjusted income in each country. Countries were ranked from highest (1) to lowest (10) and the median rank across the five inequality measures for each adjusted income measure is given in each of the middle four columns of this table. Essentially, this process repeats the calculations in Table 5 for each adjusted income concept, and records the median RO for each income concept as in the final column of Table 5. For instance, the first column in this table is the final column of Table 5 for unadjusted D.

are sensitive to these adjusted income distributions and hence the very different rankings of inequality scores found in Table 7 for these two countries. The changes in the rank ordering of these two countries, of course, affects the rankings of the other countries. If one leaves Israel and Australia out of the analysis, one finds a change of the rank orders only for STAT in Canada and Switzerland; the rest of the ranks stay stable. From this table, we conclude that equivalence scales have in general no great effect on the rank order of measured inequality across countries as long as average family size is not extremely large.

Absolute differences in inequality measures across equivalence adjusted income measures are shown in Table 8 for each inequality index. For each inequality measure, a score (times 1,000) is computed for each adjusted income concept in each country. Four sets of differences across inequality scores are shown for each measure. The differences are numbers (1) through (4) and are defined in the note to the table. Each change generally indicates movement from a lower to a higher e value as presented in the previous section of the paper. For the countries with rather unequal distributions of disposable income, inequality decreases from the DPI to the CONS and increases from this point on. For the countries with a rather equal distribution, inequality decreases from the DPI to the PROG and increases only between PROG and STAT. Israel seems again to be an exception in the sense that its increase in inequality starts between the SUBJ and CONS difference. In general, the table indicates that with increasing values of the exponent, e, inequality first decreases, but then increases again. The first derivative of the inequality measure is therefore an increasing function of the e value. In other words, measured differences in inequality get smaller and

TABLE 8

INEQUALITY DIFFERENCES ACROSS COUNTRIES (EXPRESSED AS MEASURE TO MEASURE DIFFERENCES, SEE NOTE) USING DIFFERENT INEQUALITY MEASURES AND EQUIVALENT INCOME MEASURES

	Atkinson 0.8				Atkinson 0.5			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Israel	−5	+1	+8	+13	−2	+1	+6	+8
Germany	−17	−4	−3	+4	−10	−3	−1	+3
U.K.	−17	−5	−5	−0	−11	−3	−3	+1
Norway	−19	−6	−3	+6	−11	−3	−2	+2
Sweden	−25	−8	−6	−0	−16	−4	−4	0
Canada	−13	−3	−1	+4	−8	−2	0	+3
U.S.A.	−13	−2	−1	+6	−8	−1	0	+5
Switzerland	−15	−3	+1	+8	−9	−1	+1	+5
Australia	−14	−3	−3	+3	−9	−2	−1	+2
Netherlands	−7	−1	+4	+8	−5	−0	+2	+5
Total	−15	−4	−0	+5	−8	−2	0	3

	Gini				Theil				Coefficient of Variation			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Israel	−1	+4	+13	+17	−2	+3	+15	+17	+1	+10	+37	+38
Germany	−23	−6	−2	+7	−19	−5	−2	+6	−35	−8	−1	+16
U.K.	−19	−5	−4	+2	−19	−6	−4	+3	−35	−10	−4	+10
Norway	−24	−7	−2	+8	−20	−7	−2	+6	−43	−15	−5	+22
Sweden	−40	−14	−13	+2	−30	−9	−8	−0	−69	−23	−21	+2
Canada	−15	−2	+1	+9	−15	−2	+1	+8	−26	−3	+7	+24
U.S.A.	−15	−2	+2	+9	−16	−2	+3	+10	−27	−4	+10	+27
Switzerland	−19	−3	+5	+14	−15	−3	+4	+11	−21	−1	+9	+24
Australia	−17	−4	−1	+6	−18	−4	−1	+6	−34	−8	+2	+16
Netherlands	−11	−5	+5	+12	−10	−1	+5	+10	−23	−4	+8	+22
Total	−18	−5	+1	+9	−16	−4	+2	+8	−31	−7	+5	+20

Source: LIS database

Note: Differences are based on differences in inequality scores times 1,000, where the differences are:

(1) DPI-SUBJ (2) SUBJ-CONS (3) CONS-PROG (4) PROG-STAT

Method: For each country this table shows the absolute differences for each of our five inequality scores (times 1,000) between each pair of income measures given in the note above.

smaller with increasing exponent values up to a zero point (the point where e approaches 0.5 are seen in equation (3)), and beyond which the differences tend to increase, indicating greater measured inequality. However, while this pattern of differences is consistent, moving right to left within any inequality measure, the magnitude of differences across both countries and measure varies considerably. We conclude that as the exponent values implicit in each equivalence scale (essentially the elasticity of the equivalence scale to family size) increase, differences in measured inequality at first decrease and then increase in a systematic way.[4]

[4]As mentioned above, if Lorenz curves do intersect, inferences about changing patterns derived from inequality measures can be contradictory. The intersections for the distributions in Table 8 can be seen in Appendix Table 2. About half of all Lorenz curves do intersect. Still there are by far, less intersections than were found in the country comparison for disposable income (Table 7). The intersections here are in general also much smaller; the Lorenz curves are more parallel in this case. But still in all cases where the Lorenz curves do intersect, one can make no statements about directional changes in inequality with a single value inequality measurement index. Multidimensional inequality measures like decile analyses have to be used where the Lorenz curves intersect.

VI. Equivalence Scales and Poverty

To shift from a concern with the inequality of the whole income distribution to an examination of poverty rates and poverty gaps, we must specify a poverty line. As with equivalence scales, definitions of poverty or low income are highly varied across countries, and we have not undertaken a systematic survey of the various poverty lines. For the detailed analysis which follows in Sections VII and VIII we will define poverty lines as equal to one half of the median adjusted income (or well-being) measure. But first we will explore the sensitivity of poverty rates to the poverty line definition itself.

Table 9 presents these medians, and for comparison three nations' poverty lines all for a family of three persons. Poverty lines are converted across countries using OECD purchasing power parities. Note that there is a wide range in the percentage of a country's median well-being (WB) which these lines represent—

TABLE 9

Disposable Income and Adjusted Income Medians for Four Equivalence Scales and Three National Poverty Lines in Own Currency

A. Median Incomes for a Three Person Family:

Country	D	SUBJ	CONS	PROG	STAT
Australia	15,900	15,266	15,000	14,639	14,336
Canada	23,300	22,505	22,277	21,592	20,953
Germany	34,000	33,691	33,712	33,669	33,746
Israel	21,700	19,346	18,564	17,384	16,452
Netherlands	29,400	28,559	28,514	28,363	28,232
Norway	79,500	76,332	75,444	73,560	72,123
Sweden	75,200	78,701	81,236	84,356	88,224
Switzerland	41,200	42,378	43,217	44,465	45,435
U.K.	5,700	5,528	5,495	5,307	5,073
U.S.A.	15,600	15,135	15,000	14,639	14,557

B. National Poverty Lines for Three Person Families:[1]

				(As percent of median well-being (WB)[2])		
Country	U.K.	U.S.A.	Sweden	U.K.	U.S.A.	Sweden
Australia	5,584	6,994	9,253	37.7	47.3	62.5
Canada	6,310	7,903	10,456	28.9	36.2	47.9
Germany	13,422	16,812	22,242	39.8	49.9	66.0
Israel[3]	na	na	na	na	na	na
Netherlands	13,768	17,246	22,816	48.5	60.7	80.3
Norway	30,137	37,748	49,940	40.5	50.8	67.2
Sweden	31,140	39,004	51,601	37.5	47.0	62.2
Switzerland	13,942	17,463	17,463	31.8	39.8	39.8
U.K.	2,095	2,624	3,471	39.2	49.1	65.0
U.S.A.	4,601	5,763	7,624	31.0	38.9	51.4

Source: LIS database

Notes:

[1]Poverty lines converted to other currencies using OECD measures of purchasing power parity. SUBJ, CONS, PROG, STAT are all normalized to the income of a three person family.

[2]Percentage comparisons based on the average of the four median adjusted income or well-being (WB) measures from panel A above.

[3]The OECD has no estimate of purchasing power parity for Israel.

the U.K. poverty line has a purchasing power of only 29 percent of the Canadian median but 49 percent of the Dutch median. The Swedish poverty line is the highest, amounting to 62 percent of its median well-being. The UK and US poverty lines are similar in that each marks a point close to 39 percent of the country's median well-being.

To what extent do we get a different impression of poverty in these countries if we use a low relative poverty line like the U.K. and U.S. lines, a high one like the Swedish, or one in between? The top panel in Table 10 presents the poverty rate (per cent of all persons living in families with incomes below the poverty line) in each country for poverty lines defined at 40 percent, 50 percent and 60 percent of the medians of disposable income (D) and the four adjusted income (or well-being) measures, WB. Table 11 indicates the corresponding average poverty gap (difference between poverty line and income for poor families)

TABLE 10

PERCENT POOR BY COUNTRY BASED ON DISPOSABLE INCOME (D) AND ON FOUR EQUIVALENCE SCALE BASED WELL-BEING (WB) MEASURES; POVERTY LINE EXPRESSED AS A PERCENT OF MEDIAN WB LEVELS

	Poverty Line, 50% Median WB					Poverty Line, 40% Median WB				
Country	D	SUBJ	CONS	PROG	STAT	D	SUBJ	CONS	PROG	STAT
Australia	18.0	16.0	14.8	12.3	11.7	12.1	9.9	8.6	6.4	6.6
Canada	17.1	15.0	14.4	13.2	12.3	11.7	10.1	9.4	8.1	7.3
Germany	10.5	7.6	6.6	5.2	5.4	6.9	4.3	3.7	2.6	2.4
Israel	13.6	12.0	11.9	12.1	15.5	8.3	6.9	5.7	5.6	5.1
Netherlands	9.7	7.3	7.2	8.0	8.8	5.5	4.8	4.8	5.1	5.7
Norway	14.3	10.3	8.9	5.1	5.2	9.2	5.9	3.1	2.8	2.8
Sweden	13.9	7.9	6.5	5.4	5.3	6.9	4.3	3.5	3.3	3.3
Switzerland	13.6	10.5	9.8	8.5	8.3	8.9	6.3	5.7	4.8	4.7
U.K.	17.0	15.2	14.0	11.4	8.1	12.1	10.1	8.8	4.2	3.2
U.S.A.	19.7	17.9	17.8	17.2	17.2	14.5	13.0	12.3	11.4	12.1

	Poverty Line, 60% Median WB				
Country	D	SUBJ	CONS	PROG	STAT
Australia	23.1	21.4	20.6	19.5	17.8
Canada	22.8	20.7	20.5	19.0	17.7
Germany	16.3	13.2	12.2	11.3	11.6
Israel	19.9	18.9	18.6	19.8	22.0
Netherlands	15.2	13.1	12.0	12.8	15.1
Norway	19.9	15.7	14.5	11.9	9.0
Sweden	21.3	14.6	21.1	8.9	9.1
Switzerland	19.0	15.9	15.1	14.2	14.8
U.K.	21.1	19.7	19.8	18.7	18.7
U.S.A.	25.9	24.3	23.7	22.6	23.6

Source: LIS database

Method: Family adjusted income or well-being (WB) normalized to the income of a three-person family. Next WB is compared to the appropriate poverty line in each country where the poverty line is defined as a percent of median WB. The percentage of all persons living in families with WB below the stated cutoff are considered poor.

TABLE 11

POVERTY GAP AS PERCENT OF MEDIAN WB, GAP BASED ON POVERTY LINES EXPRESSED AS VARYING PERCENTAGES OF MEDIAN WB BY COUNTRY FOR DISPOSABLE INCOME (D) AND FOUR EQUIVALENCE SCALE BASED WELL-BEING (WB) MEASURES

	Poverty Line, 50% Median WB					Poverty Line, 40% Median WB				
Country	D	SUBJ	CONS	PROG	STAT	D	SUBJ	CONS	PROG	STAT
Australia	18.9	16.7	16.2	16.4	17.0	15.4	13.8	14.1	16.4	16.0
Canada	19.0	17.8	17.3	16.7	16.9	15.1	13.7	13.7	13.7	14.6
Germany	17.3	14.9	14.4	14.1	12.5	12.9	11.8	11.6	12.2	11.9
Israel	16.0	13.0	12.1	11.1	9.7	12.7	8.8	9.1	7.8	9.2
Netherlands	21.0	24.9	25.6	24.5	23.1	22.9	25.4	25.9	25.1	23.1
Norway	17.4	14.6	13.6	16.9	16.5	14.2	11.5	18.2	16.7	15.8
Sweden	14.0	15.5	16.5	17.5	17.4	12.7	14.7	16.4	15.5	15.1
Switzerland	18.8	17.5	17.3	17.3	17.1	15.7	15.5	16.0	16.6	16.2
U.K.	17.2	14.8	13.6	10.7	11.4	12.0	9.5	7.7	8.2	10.1
U.S.A.	21.2	20.4	19.9	19.0	19.6	17.1	16.1	16.5	16.1	15.4

	Poverty Line, 60% Median WB				
Country	DPI	SUBJ	CONS	PROG	STAT
Australia	23.9	21.4	20.3	18.6	19.2
Canada	23.0	21.5	21.0	20.2	20.4
Germany	19.2	16.2	15.8	13.8	12.9
Israel	19.5	16.5	16.1	15.1	15.4
Netherlands	21.7	21.4	23.3	23.1	21.2
Norway	21.2	18.1	16.6	14.7	17.4
Sweden	17.4	16.3	16.9	18.9	18.1
Switzerland	22.0	19.9	19.4	18.6	17.4
U.K.	23.0	20.3	18.2	15.1	12.0
U.S.A.	25.1	23.9	23.9	23.4	22.9

Source: LIS Database

Method: Family adjusted income or well-being (WB) is compared to the appropriate poverty line in each country where the poverty line is defined as a percent of median WB. For all families with WB below the stated cut off the differences between WB and the cut off (poverty gap) is expressed as a percent of the median WB in each country. This fraction is interpreted as the average poverty gap for each country.

expressed as a percent of the median for each of these same measures of equivalent well-being and poverty.

We see that in most countries poverty declines as the equivalence elasticity increases. However, equivalence makes much more difference in some countries than in others. At all three poverty lines, U.S., Israeli and Dutch poverty decline very little if at all with increasing size elasticity. In the other countries the declines are often substantial. Norway's rate drops most dramatically. For all scales and lines the United States has the highest poverty rate but the country with the lowest rate varies by scale and/or poverty line.

The degree of agreement in the ranking of the countries from high to low in poverty rates using these three different lines is different for the different scales. The correlation beteen rates at the 40 percent and 60 percent lines is 0.77 for

D, rises to 0.93 for the SUBJ scale, and falls for CONS to 0.86, to 0.65 for PROG and to 0.53 for STAT. Thus, if one chooses an equivalence scale to adjust income to well-being which is close to STAT cross-national comparisons of poverty rates will be quite sensitive to the choice of poverty line level; if one chooses a scale closer to SUBJ, the ranking of countries will be about the same at any line between 40 percent and 60 percent of the median. Hence, both the choice of equivalence scale and the choice of poverty line may affect rankings across countries.

In the latter (SUBJ) case, we conclude, for any of these levels (40 to 60 percent of the poverty line) that Sweden, The Netherlands, and Germany form a low poverty cluster, followed by Norway and Switzerland. Israel will have a middling poverty rate; Australia, Canada and the United Kingdom a high rate, and the United States the highest rate.

If one chooses an equivalence at the PROG level (which as noted earlier is the closest to a consensus equivalence scale for national poverty lines) the countries at the extremes are about the same at the 40 percent and the 60 percent lines, but in between the poverty line level makes a great deal of difference. Australia, Canada, Israel and the UK all have high poverty rates at the 60 per cent line, but they have quite different rates at the 40 percent line—the U.K. is clusted at a low level with The Netherlands and Switzerland, but Australia and Canada have high rates.

Interestingly, average poverty gaps are not often greatly affected by choice of equivalence scale. Each higher poverty line increases the gap for the people who were already poor at the lower level but also brings in a large group with small poverty gaps since they are situated between the lower and higher lines. (For example, the maximum average poverty gap for persons poor at the 60 percent line and not at the 40 percent is 20 percent.) Hence, poverty gaps react quite differently than do poverty rates to changing levels of poverty lines and equivalence scales.

VII. Equivalence and Poverty Rates of Demographic Groups

How do poverty rates for particular groups *within* nations vary as the equivalence elasticity changes? Does the composition of the poor in terms of age, family type, presence of children, change a great deal from one equivalence scale to another? To simplify the exposition, we explore these issues in this section using one poverty line—50 percent of the median WB level.

In order to answer these questions we have analyzed poverty rates in each country as a function of heads who are elderly versus nonelderly, families headed by a married couple or a single man or woman, presence of children, and presence of adults other than head and spouse. That analysis indicated that to understand how equivalence elasticities affect the composition of the poor it is useful to look at poverty rates for ten separate groups. (See accompanying diskettes for the percent of cases of each type in the ten countries.) These groups[5] are defined as

[5]In defining these groups we have taken account of the presence of children only for families with heads under 60—a few of those in the 60 and over groups will also be parents or grandparents of children (under age 18) living in the same unit.

follows:

A. Head under 60:

Single man
Single woman
Solo mother with one child
Solo mother with two or more children
Married couple with no children
Married couple with one child
Married couple with two or more children

B. Head 60 years or older:

Single man
Single woman
Married couple

In all countries married couples with one or no children are not very often poor. Equivalence choices make only a small difference in these low rates, as can be seen in Table 12. For other groups the differences among countries are greater, and equivalence choices often have a dramatic effect.

TABLE 12

PERCENTAGE POOR BY FAMILY TYPE AND COUNTRY FOR DISPOSABLE INCOME (D) AND FOUR EQUIVALENCE SCALES BASED WELL-BEING (WB) MEASURES

Family Type and Income Concept		Country									
		AUS	CAN	GER	ISR	NL	NOR	SWE	SWI	U.K.	U.S.A.
A. Head Less Than 60:											
Single man	D	32.8	36.9	14.8	29.0	28.8	22.9	32.2	26.3	27.1	36.4
	SUBJ	23.9	27.5	12.4	12.9	19.9	17.4	21.6	20.0	16.1	26.9
	CONS	20.6	24.5	11.4	9.7	16.5	15.2	18.8	18.8	13.6	23.6
	PROG	16.6	17.4	7.6	6.1	16.5	10.6	14.9	17.1	10.1	18.1
	STAT	13.6	14.6	5.8	6.1	15.5	11.6	12.4	15.4	8.3	15.4
Single woman	D	42.1	42.0	33.5	40.0	34.2	51.4	28.9	29.2	37.9	48.8
	SUBJ	30.2	31.0	20.5	21.7	21.7	32.4	15.1	18.5	23.8	33.6
	CONS	26.0	26.5	18.1	23.6	17.8	28.8	12.8	16.1	19.3	29.4
	PROG	18.7	19.4	7.6	16.4	15.0	14.7	9.8	13.0	12.8	23.5
	STAT	14.5	14.7	6.2	8.5	14.8	11.8	9.6	10.5	8.7	19.7
Solo mother with one child	D	48.8	43.2	18.3	31.6	19.7	30.7	10.3	21.3	36.5	48.1
	SUBJ	45.3	38.7	15.4	21.1	14.8	22.5	8.4	18.2	32.5	44.6
	CONS	43.9	37.1	13.2	15.8	9.6	21.8	8.0	17.0	30.1	42.9
	PROG	42.5	35.2	9.2	5.3	9.7	17.0	8.0	15.7	22.9	39.7
	STAT	39.8	33.5	9.3	5.3	14.3	14.3	7.5	15.7	21.3	37.5
Solo mother with two or more children	D	61.2	52.2	4.6	2.4	35.5	17.2	6.8	19.1	32.1	53.9
	SUBJ	64.6	51.8	4.6	19.5	31.4	17.7	8.3	22.5	31.9	57.6
	CONS	64.4	52.5	4.6	19.0	33.1	17.2	8.8	22.5	31.9	60.5
	PROG	63.8	55.0	4.6	19.5	39.3	19.8	13.5	27.0	31.7	62.9
	STAT	65.3	56.4	4.6	19.5	39.1	21.1	16.0	27.0	31.7	65.5
Married couple with no children	D	5.8	6.5	2.5	10.3	6.8	6.6	3.4	3.1	3.8	6.5
	SUBJ	4.5	5.1	2.3	4.7	6.3	4.5	3.2	2.3	2.8	5.4
	CONS	3.8	4.6	2.3	4.8	6.3	4.5	2.9	2.4	2.4	5.0
	PROG	2.7	4.0	2.2	2.9	6.1	4.1	2.6	2.0	1.7	4.2
	STAT	2.3	3.7	2.2	3.7	6.3	3.7	2.3	1.7	1.6	4.0

TABLE 12—CONTINUED

Family Type and Income Concept		Country									
		AUS	CAN	GER	ISR	NL	NOR	SWE	SWI	U.K.	U.S.A.
Married couple	D	6.9	5.6	1.3	5.0	7.1	2.5	2.2	1.9	2.8	6.1
with one	SUBJ	6.7	5.5	1.3	4.3	7.8	2.1	2.7	1.9	2.6	5.7
child	CONS	6.5	5.5	1.7	3.4	7.8	1.9	2.8	2.1	2.6	5.7
	PROG	6.2	5.1	1.7	2.9	8.5	2.1	3.1	2.2	1.9	5.4
	STAT	6.1	4.8	2.6	3.7	8.7	1.7	3.9	2.2	1.7	5.3
Married couple	D	5.9	6.9	0.7	5.6	3.6	1.6	1.9	1.5	2.8	6.5
with two	SUBJ	7.6	8.4	1.2	7.0	4.4	2.3	2.7	3.2	4.4	8.2
or more	CONS	8.6	9.4	1.4	7.9	5.4	2.7	3.3	4.5	4.7	10.1
children	PROG	10.3	12.0	3.4	11.4	7.4	3.1	4.7	6.3	6.7	13.0
	STAT	12.9	13.8	6.5	18.0	9.8	3.9	6.3	9.5	7.8	15.6
B. Head 60 or Over:											
Single man	D	58.8	57.3	36.4	43.3	34.6	60.7	54.9	57.9	71.8	56.1
	SUBJ	53.1	46.0	25.4	28.1	10.0	46.2	28.3	47.1	59.4	48.3
	CONS	47.2	42.7	22.0	26.7	4.8	39.0	15.4	40.7	51.3	44.3
	PROG	22.2	26.8	15.6	15.6	4.8	10.4	6.3	21.5	34.1	34.4
	STAT	5.1	15.2	11.4	13.3	4.8	10.5	1.2	9.9	13.8	26.8
Single woman	D	63.5	62.1	58.8	67.3	43.8	75.8	65.1	63.9	71.9	61.3
	SUBJ	54.4	52.9	40.1	52.5	11.0	58.4	21.2	42.7	65.8	52.2
	CONS	50.0	49.5	31.4	48.1	7.5	45.7	11.6	32.4	61.6	48.2
	PROG	26.1	35.3	17.4	35.0	6.2	7.3	2.8	19.1	41.1	38.1
	STAT	5.0	16.2	10.2	30.5	5.9	5.6	0.0	11.3	12.9	30.5
Married couple	D	37.8	24.6	17.1	34.8	5.8	17.6	2.6	10.3	43.0	21.6
	SUBJ	27.4	17.9	11.4	29.3	4.2	5.9	1.9	7.4	37.0	17.4
	CONS	19.7	14.7	9.9	26.6	4.3	4.3	2.0	7.2	32.9	16.0
	PROG	8.4	10.3	7.9	22.0	4.3	3.1	1.5	6.1	23.8	14.5
	STAT	7.1	8.8	6.7	21.3	4.1	2.4	1.5	4.9	13.5	13.5

Source: LIS database

Method: Percentage poor is the poverty rate for persons in each type of family with poverty measured at half of the median level of WB using each of the five WB measures.

For solo mothers with two children, equivalence scales seem not to have a strong effect, but there are dramatic differences among countries, with the U.S., Canada and Australia having poverty rates of 50 percent or more for all scales, and Germany, Israel, Sweden and Norway having much lower rates.

In the case of solo mothers of one child, both country and equivalence scale adjusted income measure can make a big difference. The countries with the highest rates are the same three (Australia, Canada, U.S.), and their rates are not greatly affected by the equivalence scale chosen. Sweden's low rate, and Switzerland's middling rate are not much affected by the scale. But in Germany, Israel, The Netherlands and the U.K., the rate drops by 40 percent or more as one shifts from the SUBJ to the PROG scale. These changes affect both relative poverty rates (as compared to other groups) and rank among countries.

The rates for the 60 and over group is, as expected, almost always higher than for the comparable group under 60, but the scale has a considerable effect for both age groups. The larger the equivalence (or e) factor, the lower the poverty

rate among these single persons (and among older married couples). Younger single women generally show a larger decrease than younger single men.

It seems reasonable to conclude that groups that have a heavy concentration of UNITS around half of the median WB are going to be most affected by changes in the equivalence factor. Groups with fewer persons in this range will not be as much affected. For example, a single woman earning around 35 percent of median disposable income is likely to be poor under the SUBJ scale, but well above poverty under the PROG scale. If there are many women like her then we will see a large effect of changing the equivalence scale from SUBJ to PROG. If there are few single or married men in that disposable income range, then that group will be much less affected by a change in equivalence.

For instance, the poverty line for a single person drops by over a quarter as we move from SUBJ to PROG, and by roughly 40 percent if we move from SUBJ to STAT. But the scale only affects persons whose disposable income is in that range. Those whose income is above or below the highest or lowest poverty line for their family will not be moved into or out of poverty by choice of scale.

We observe that married couples with two or more children are also not very often poor compared to other family types—the highest figure is 18 percent for Israel using STAT (a result of the large average family size for this group compared to the two plus families in other countries). Given these overall low levels of poverty, families with two or more children do show quite different rates depending on choice of scale—ranging from 8 percent to 16 percent in the U.S., or 1.2 percent to 6.5 percent in Germany. However, the same four countries have the highest poverty rates for this group regardless of scale.

As noted the poverty rate for all of the older groups is quite sensitive to the choice of scale, as might be expected given their heavier concentration of disposable incomes under the median. For example, 38 percent of the Australian older married couples have incomes under half of the median D; 27 percent are poor using the SUBJ scale compared to only 8 percent using the PROG scale. The pattern is the same in most of the other countries. Only in Sweden are as few as 2 percent of older married couples poor under any equivalence assumption; but the rates are low for any scale in Switzerland, Germany, The Netherlands and Norway, as well.

The poverty rate changes with scale changes are more dramatic for single older persons since they have lower incomes than married couples and their relative position shifts more with scale changes. Roughly 60 percent or more of older single women have disposable incomes below half the median. Whether one calls them poor or not depends on how far below the median they are (compare Sweden and the U.K. in Table 10), and what scale is used. In the U.K., poverty rates for this group fall from 66 percent with the SUBJ scale to 41 percent with PROG and only 13 percent with STAT—in Sweden only 21 percent are poor even using SUBJ, and this falls to 3 percent under PROG and 2 percent under STAT. Norway and the other continental European countries share the Swedish pattern at higher elasticities. The U.S., along with Australia, Canada and Israel share the U.K. pattern, although in the United States and Israel older women's poverty stays high (over 30 percent) even under STAT.

We conclude that the distribution of family types around the level of the poverty line, whether for different poverty lines using the same equivalence-based WB measure, or for the same poverty line using different equivalence-based WB measures, is crucial to determining the sensitivity of the poverty rate to both choice of poverty line and WB measure. Because a comparison of point estimates of poverty rates across countries for any one group, and especially for several groups, is sensitive to both the level of the poverty line and the equivalence scale which adjusts for family size differences, authors (and consumers) should be careful to note the sensitivity of their estimates, and the policy implications which they generate, to choice of poverty line and scale.

VIII. Equivalence and the Composition of the Poor

We have seen the complex ways in which equivalence scales affect the rates of poverty across different demographic groups. The factors producing these differences in interaction with the share of each of these groups in the total population also play a role in the total poverty rate for each country detailed in Table 10. A third perspective on the interrelation of demographic group size, disposable income distribution and equivalence scale adjustments asks the question: How does the choice of equivalence scale affect the relative proportion of the poor who come from each of these groups? Is it the case that we see poverty as more of the problem of the elderly under one scale than another, for example? Table 13 gives the percentage distribution of the poor (WB less than half the median) in these demographic groups according to each scale. Because of their overall population weight the two groups that shift the most in their share of the poor under different equivalence assumptions are older persons and married couples with two or more children.

Taking all three older groups together, we find sharp declines in their share of the poor as the equivalence factor increases. In Norway, for example, 61 percent of those with disposable incomes under half of the median are older people. They are 55 percent of the poor with the SUBJ scale, 23 percent with PROG and only 18 percent with STAT. In Australia older people are 37 percent of the poor under SUBJ, 19 percent under PROG and 9 percent under STAT. Using SUBJ or CONS the old compose a majority of the poor in Germany, Israel, Norway, the U.K. and the U.S.A., but with PROG this is the case only in Germany and the U.K.

Families of a couple with two or more children show the opposite effect. They are a much smaller proportion of the poor under SUBJ and CONS than under PROG or STAT. However, only in Israel do they ever constitute as many as half of the poor. Under PROG they are as many as a quarter of the poor in most of the other countries, declining to 20 percent in Germany. Under SUBJ these families represent around a tenth or less of the poor in half of the countries, and more than a quarter in only one. Married couples with fewer children are a small proportion of the poor in all countries but The Netherlands, and their share does not change much under different scales.

The poverty of solo mothers and their children is a subject of much policy discussion in all of these countries (Hauser and Fischer [1988]). But, as a share

TABLE 13

PERCENTAGE OF THE POOR IN EACH FAMILY TYPE BY COUNTRY FOR DISPOSABLE INCOME (D) AND FOUR EQUIVALENCE SCALE BASED WELL-BEING (WB) MEASURES

Family Type and Income Concept		Country									
		AUS	CAN	GER	ISR	NL	NOR	SWE	SWI	U.K.	U.S.A.
A. Head Under 60:											
Single man	D	9.4	11.1	7.4	2.2	9.9	11.2	25.4	20.0	5.4	10.8
	SUBJ	7.7	9.4	8.5	1.1	9.1	11.9	29.8	19.7	3.6	8.8
	CONS	7.1	8.8	8.9	0.8	7.7	11.8	31.4	19.9	3.3	7.8
	PROG	7.0	6.8	7.7	0.5	6.9	14.4	30.2	20.6	3.0	6.1
	STAT	6.0	6.1	5.6	0.4	5.9	15.6	25.5	19.2	3.5	5.2
Single woman	D	9.1	11.6	12.7	5.8	10.3	9.6	12.4	17.7	6.7	11.1
	SUBJ	7.4	9.7	10.7	3.5	8.7	8.4	11.4	14.5	4.7	8.4
	CONS	6.8	8.6	10.9	3.6	7.3	8.8	11.8	13.6	4.2	7.4
	PROG	6.0	6.9	5.9	2.4	5.5	7.7	10.9	12.5	3.4	6.1
	STAT	4.8	5.6	4.6	1.1	4.9	6.1	10.8	10.3	3.2	5.2
Solo mother with one child	D	5.8	5.1	2.1	1.4	2.8	4.6	1.9	2.3	2.9	7.6
	SUBJ	6.1	5.1	2.5	1.1	2.8	4.8	2.8	2.5	2.9	7.7
	CONS	6.3	5.1	2.4	0.8	1.9	5.2	3.2	2.5	2.9	7.5
	PROG	7.4	5.3	2.2	0.3	1.7	7.2	3.9	2.6	2.7	7.1
	STAT	7.3	5.4	2.1	0.2	0.9	6.1	3.7	2.7	3.6	6.8
Solo mother with two or more children	D	10.5	10.5	0.5	0.2	6.0	3.8	1.2	2.0	5.6	17.3
	SUBJ	12.4	11.8	0.7	2.2	7.1	5.5	2.6	3.1	6.2	20.3
	CONS	13.4	12.5	0.8	2.2	7.5	6.1	3.4	3.3	6.8	21.5
	PROG	16.2	14.2	1.1	2.2	8.1	12.0	6.3	4.5	8.3	23.0
	STAT	17.3	15.7	1.0	1.7	7.3	12.7	7.6	4.7	11.7	24.0
Married couple with no children	D	4.7	5.7	3.9	6.7	12.9	2.7	3.0	2.7	3.3	4.4
	SUBJ	4.0	5.1	4.9	3.5	16.1	2.6	4.9	2.6	2.7	4.0
	CONS	3.7	4.7	5.6	3.6	16.3	3.0	5.4	3.0	2.5	3.7
	PROG	3.2	4.5	6.9	2.2	14.2	4.8	5.9	2.8	2.2	3.2
	STAT	2.8	4.5	6.6	2.1	13.2	4.2	5.3	2.5	3.0	3.1
Married couple with one child	D	5.0	5.3	2.4	4.6	12.4	2.1	2.0	1.5	2.4	4.5
	SUBJ	5.5	5.9	3.4	4.3	18.3	2.4	4.3	2.0	2.5	4.7
	CONS	5.7	6.1	4.8	3.6	18.6	2.5	5.6	2.3	2.7	4.7
	PROG	6.7	6.1	6.2	3.0	18.2	4.8	7.5	2.8	2.5	4.6
	STAT	6.9	6.3	9.3	2.9	16.9	3.8	9.4	2.9	3.1	4.6
Married couple with two or more children	D	13.7	14.9	2.1	22.4	13.8	5.0	3.7	3.8	6.3	11.1
	SUBJ	19.8	20.7	4.9	31.7	22.2	9.8	9.3	10.3	11.	15.4
	CONS	24.1	24.2	6.3	36.4	28.0	13.2	14.0	15.6	12.8	19.1
	PROG	35.0	33.5	19.8	51.6	34.6	26.8	23.8	25.0	22.5	25.4
	STAT	46.0	41.4	36.5	63.8	41.4	33.0	32.6	38.8	36.9	30.4
B. Head 60 or Over:											
Single man	D	4.3	4.6	6.4	3.1	4.7	11.4	12.3	8.3	8.2	4.2
	SUBJ	4.3	4.2	6.2	2.4	1.8	11.7	11.1	8.6	7.6	4.0
	CONS	4.2	4.1	6.1	2.2	0.9	11.3	7.3	7.9	7.1	3.7
	PROG	2.4	2.8	5.6	1.4	0.8	5.3	3.6	4.9	5.8	3.0
	STAT	0.6	1.7	3.9	0.8	0.7	5.2	0.7	2.3	3.3	2.3
Single woman	D	14.7	15.3	40.2	16.3	19.9	32.3	35.2	32.0	26.3	16.0
	SUBJ	14.2	14.9	37.8	14.4	6.7	34.8	20.1	28.0	27.0	15.0
	CONS	14.1	14.5	33.9	14.0	4.6	31.1	13.3	22.7	27.3	13.9
	PROG	8.9	11.3	24.1	9.7	3.4	8.6	3.9	15.3	22.5	11.4
	STAT	1.8	5.5	13.6	6.7	3.0	6.6	0.0	9.3	9.9	9.1
Married couple	D	22.8	16.0	22.1	37.3	7.3	17.5	2.8	9.5	32.8	13.0
	SUBJ	18.6	13.2	20.3	35.8	7.2	8.1	3.6	8.8	31.6	11.5
	CONS	14.4	11.3	20.2	32.8	7.3	6.9	4.7	9.3	30.5	10.7
	PROG	7.4	8.6	20.7	26.8	6.6	8.6	4.1	8.9	27.1	9.9
	STAT	6.5	7.9	16.8	20.2	5.7	6.6	4.4	7.4	21.7	9.3

of the poor they do not, at least as of the turn of the decade, loom very large outside of the United States. Just as in most countries their poverty rates do not change much with changing equivalences, their share of the poor does not change much either, although in most countries it is higher for scales in the PROG and STAT range.

Single nonelderly are a considerable proportion of the poor in Sweden and Switzerland, and represent around a fifth of the poor for all scales in Norway. In Israel and the U.K. they are not an important factor. For the other countries this group represents close to a fifth of the poor under the SUBJ scale but smaller proportions for the PROG and STAT scales.

In sum, low equivalence factors tend to portray a poverty population as primarily composed of older people and single younger people—these are the most heavily over-represented groups and they are relatively large. Under SUBJ all but the U.S. and The Netherlands draw a majority of their poor from these groups—rising to three quarters or more in Germany, Norway, Sweden, Switzerland and the U.K. Higher values of the equivalence factor, which make larger adjustments in needs for increasing family size, shift the focus away from the old and to families with two or more children. But, only in countries with relatively higher poverty rates do such families constitute a near or actual majority of the poor under PROG or STAT. But still, this analysis indicates that for those interested in cross-national aspects of the "generational equity" debate (Preston [1984]; Smeeding, Torrey, and Rein [1988]) as it is reflected in concentrations of old versus children in poverty, careful attention need be paid to choice of equivalence factor.

VIII. Conclusions

The LIS database offers researchers exciting new possibilities for international comparisons based on household income microdata. Along with the flexibility afforded by microdata come important choices of perspective: definition of income accounting units, income measure, and particularly germane for our purposes, definition of equivalence scales to adjust family incomes for differences in need which vary systematically by family size and composition. Choice of income accounting units and income measures has been carefully discussed in this journal (e.g. Danziger and Taussig [1979]) and elsewhere for some time, with either the family (the unit used in this paper) or the household emerging as the most defensible unit for measuring inequality and poverty, and with disposable (after tax and transfer) money income emerging as the most theoretically satisfying annual income measure for these same purposes. However, choice of equivalence scales has not before been subject to such careful scrutiny. While no clearcut "winner" or theoretically most satisfying equivalence scale has yet emerged, the range of potential equivalences that can and are being used to adjust incomes for size and related differences in needs span a wide spectrum

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Source: LIS database

Method: Number of poor persons in each cell is determined from Table 12, then calculated as a percent of total poor persons. Percentages in each group/country cell add up to 100 percent.

(Table 2). The purpose of this paper has been to choose four prototypical scales from the available set, to classify them according to their elasticity with respect to log of family size, and to test the sensitivity of various income inequality and poverty measures to choice of equivalence scale using the LIS database.

The results of our analysis may surprise some, but not others, the authors included. Choice of equivalence scale can systematically effect comparative absolute and relative levels and rankings of countries (or groups within countries) with respect to measured inequality and poverty. Because of these sensitivities, one must carefully consider summary statements and policy implications derived from cross-national comparisons of poverty and/or inequality. Thanks to LIS, the range of cross-national differences attributable to basic country-specific differences in income measures and definitions and choice of income accounting units has narrowed considerably. But in so doing, the sensitivity of comparative cross-national income and poverty research to choice of equivalence scales, which was not clearly evident in earlier studies, has now come to the fore. Clearly, there is a great deal of room for continued discussion and research on these issues, and we urge others to join us in exploring these sensitivities. A good place to begin is the diskettes included with this article. Those wishing to further explore this phenomenon and other related issues using the LIS dataset should read through the abbreviated User Package on the first enclosed diskette, and then contact the authors.

APPENDIX TABLE 1

DIFFERENCES IN GINIS THROUGHOUT GROUPING OF DATA

	GINI Without Grouping	Grouped GINI
Israel	291	292
Germany	324	280
U.K.	299	303
Norway	262	255
Sweden	267	264
Canada	305	306
U.S.A.	329	330
Switzerland	306	292
Australia	312	314
Netherlands	301	302

Source: LIS database

Method: Grouped Gini coefficients based on the transformation explained in Footnote 3 are compared to Ginis calculated using individual ungrouped family income data.

APPENDIX TABLE 2

TEST FOR CROSSING LORENZ CURVES IN TABLE 8

	DPI-SUBJ		SUBJ-CONS		CONS-PROG		PROG-STAT	
Israel	X	Y	X	.	X	.	.	.
Germany	TOP	.	TOP	.	X	.	LOW	.
U.K.	.	.	.	.	TOP	.	X	.
Norway	.	.	.	.	X	.	X	.
Sweden	.	.	.	.	.	.	X	.
Canada	.	.	.	.	X	Y	.	.
U.S.A.	.	.	TOP	.	X	Y	.	.
Switzerland	TOP	.	TOP	.	X	.	LOW	.
Australia	.	.	.	.	X	Y	.	.
Netherlands	.	.	LOW	.	.	.	.	.

X = Crossing Lorenz curves
TOP = Crossing Lorenz at the very top end of the distribution
LOW = Crossing Lorenz curves at the very low end of the distribution
Y = Contradictory statements of inequality measures

Source: LIS database
Method: See Table 8 and discussion thereof.

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