

Department of Economics
University of Konstanz

Comments on Udo Ebert
“The Redistribution on Income when Needs Differ”

Bernd Genser

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Corresponding author's address:

Prof. Bernd Genser

University of Konstanz

Box D133

D-78457 Konstanz, Germany

Phone: +49 (7531) 88-2345

Fax: +49 (7531) 88-4101

Mail: bernd.genser@uni-konstanz.de

<http://www.uni-konstanz/fiwi/>

Udo Ebert's paper¹ is a very careful and comprehensive summary of inequality measurement for households which differ not only in income but also in household composition and in needs. It is a plea for using relative household equivalence scales which allow for transforming the distribution of disposable income earned by heterogeneous households into a distribution of equivalent incomes of a fictitious population of households which allows for disregarding all other sources of heterogeneity. After this transformation usual inequality measures can be used to calculate consistent measures of household inequality or poverty.

The paper does not solve the practical problem of selecting appropriate relative equivalence scales, but forcefully argues that, when suitable equivalence scales are available, then income inequality measures based on dominant Lorenz-curves, on corresponding concentration indexes, or on inequality averse social welfare functions are equivalent. This approach implies that the direct measurement of equivalent income inequality is fully consistent to an indirect measurement of inequality via a social welfare function.

The nice message from Ebert's paper is that the inequality measurement techniques which are intuitive for a population of individuals which only differ in their income or their wealth, but are identical otherwise, can be used for a population of heterogeneous economic units which differ not only in income but also in other characteristics, e.g., households of different size and age. The vehicle needed to overcome the heterogeneity problem is an appropriate relative equivalence scale which transforms the multidimensional distribution (over income and other characteristics) into a single-dimensional distribution (over income).

In my comment I want to challenge the aesthetic beauty of generalizing income inequality measurement for households which only differ in income to heterogeneous households from two angles. The first perspective is the informational content of figures on income inequality, following a provocative note by Louis Kaplow, who raises doubts that inequality measurement is economically useful (Kaplow, 2005) The second perspective is the possibility of finding reliable relative equivalence scales from data analyses. In section 3 some problems of performing empirical analyses with equivalence scales are addressed. My conclusion is nevertheless an optimistic one, I think that inequality measures are a useful tool of positive and normative policy analyses.

1. Why Measure Inequality?

Louis Kaplow has recently formulated a harsh critique of inequality measurement (Kaplow, 2005). Focusing primarily on normative inequality measures, his conclusion is that “for normative purposes, direct measures of social welfare are superior in addressing the relevant questions” and that direct measures are also “easier to derive than normative measures of

¹ Paper presented at the 40th Economic Seminar Ottobeuren “Redistribution and Social Justice”, 12 -15 September 2010 in Ottobeuren, Germany

inequality” (Kaplow, 2005, 75). Kaplow’s argumentation is convincing: To define an appropriate equivalence scale which transforms the actual income distribution of a given heterogeneous population into a distribution of equivalent incomes requires the selection of a welfare function first. Calculating the numerical value of an inequality measure is an aggregation procedure which implies a loss of information compared to the full informational content of the corresponding equivalent-income distribution. Kaplow² therefore calls for using the full information welfare evaluation rather than the truncated income inequality information to back normative judgements. Technically his plea is to use the intermediate result on aggregate welfare and to abstain from further aggregation steps, which inevitably discards part of the information.

Kaplow however concedes that inequality indexes, e.g., the Gini Index, are useful as descriptive measures which can be used as explanatory variables in econometric models. Moreover inequality indexes facilitate communication in economic debates and allow a characterization of initial conditions or development over time in economic analyses. But the objective to find an appropriate inequality index for specific purposes will often require isolating the preconditions for unequal distributions in a theoretical model rather than measuring its effects by a common inequality measure.³ In this case inequality effects emerge as a by-product of the specific economic analysis and should be evaluated within the welfare framework applied rather than be quantified by an independent measurement concept.

2. Identification of Equivalence Scales

The specification of the equivalence scales addressed in sections 3 and 4 require both a theoretical foundation as well as a derivation from empirical data.

Relative equivalence scales can be deduced by means of expenditure functions. Using the notation of Ebert, the indirect utility of household k with attributes a_k is $V(p, X_k, a_k)$ where p is the commodity price vector and X_k total household income. Solving the dual expenditure minimization problem gives the expenditure function $e(p, u_r, a_k)$ where u_r is the utility reference level. A relative equivalence scale can then be defined by comparing the heterogeneous household k with a reference household r as

$$m(p, a_k, a_r) = e(p, u_r, a_k)/e(p, u_r, a_r) \text{ for arbitrary reference levels } u_r$$

² For a more general discussion on incorporating equity objectives in social welfare evaluations see Kaplow, 2008, chapter 15.

³ Finally Kaplow (2005, 72ff.) extends his critic of inequality measurement to poverty indexes which can be regarded a subgroup of inequality measures. In his view the problem is more serious, because descriptive poverty measures tend to be used as normative devices. Using them in this way does not only imply forgoing information by aggregation, but also neglecting distributional effects affecting households above the poverty line. Therefore usual poverty indexes seem inappropriate measures for anti-poverty policy and Kaplow’s call for direct social welfare assessments of targeted policies is even more urgent.

Since prices are identical for all households and the reference household is the same for all households considered, p and a_r may be skipped and the parameter list of the equivalence scale function can be reduced to $m(p, a_k, a_r) = m(a_k)$. The calculation of equivalence scales $m(a_k)$ requires the recovery of the unobservable expenditure functions from market data, viz. from observable Marshallian demand functions. Pollak and Wales (1979) have shown that it is impossible to recover $e(p, u_k, a_k)$ from demand data due to a fundamental underidentification problem stemming from the fact that Marshallian demand functions are identical for any positive monotonous transformation of the utility function. Blundell and Lewbel (1991) have shown that this underidentification problem can be overcome for relative equivalence scales by imposing a separability property on the expenditure function with respect to u . They show that expenditure functions which decompose into

$$e(p, u, a_k) = f(p, a_k) g(p, u)$$

allow for the identification of relative equivalence scales. This functional form ensures that equivalence scales are independent of the utility level, a property tagged “independence of base level of utility” (Lewbel, 1989) or “equivalence scale exactness” (Blackorby and Donaldson, 1993).

If relative equivalence scales are derived from the household demand database, statistical tests are recommended to test the validity of the “independence of base utility” restriction. Blundell and Lewbel (1991, 66) harshly criticise the usual approach of starting out from a conventional functional form of household utility, estimating the parameters and using them to derive equivalence scales and reject it as “inherently dishonest or at least uninformative, since in a given price regime any value of equivalence scales can be rationalized by any demand system.”

3. Equivalence scales in official statistics

Irrespective of the difficulties of defining an economically reasonable system of relative household equivalence scales there is a necessity to find an operational compromise for economically justifiable concepts to characterize and publicly communicate social inequality. The OECD has been using relative equivalence for a long time. The household characteristics used by the OECD have been the size of households and the age of household members. Table 1 presents the relative equivalence scales for certain household types used in OECD studies.

The pattern of OECD equivalence scale (column 3), sometimes referred to as the Oxford scale, assigns 1 to the first adult in a household, 0.7 for any other adult in the household and 0.3 for each child. The modified equivalence scale in column 4 keeps the values for the first adult and the children, but reduces the value for other household adults to 0.5. In recent OECD publications for international country comparisons a square root scale is chosen, which implies a constant equivalence elasticity of 0.5 by definition⁴. Columns 2 and 6

⁴ For an equivalence scale function, which depends only on the number of household members $a_k = n$, viz., $m(p, a_k, a_r) = m(n)$, the equivalence elasticity is defined by $\eta = (dm(n)/dn)(n/m(n))$. For $m(n) = \sqrt{n}$ we get $\eta = 0.5$.

characterize the extreme cases of a total per capita separation of household income and a perfect collective utilisation of household income irrespective of the household size, with equivalence elasticities of 1 and zero respectively.

Although the OECD has proposed its equivalence scales for possible use to its member countries, it is emphasized that there is no accepted method for determining equivalence scales for general use and the OECD also uses country specific equivalence scales for country reviews.

Table 1: Household Equivalence Scales for Selected Household Types

Household type ^a	Per-capita income	OECD equivalence scale (1982)	OECD-modified equivalence scale	Square root scale (2008)	Household income
A1C0	1	1	1	1	1
A2C0	2	1.7	1.5	1.4	1
A2C1	3	2.2	1.8	1.7	1
A2C2	4	2.7	2.1	2.0	1
A2C3	5	3.2	2.4	2.2	1
Equivalence elasticity ^b	1	0.73	0.53	0.50	0

Notes:

^a Read the shortcuts for household types as follows: A2C1 stands for 2 adults and 1 child.

^b The equivalence elasticity is defined as the elasticity parameter of an isoelastic equivalence scale function which is chosen as the best approximation to the given equivalence scale.

Source: OECD, 2009.

Apart from the choice of an appropriate equivalence scale an open issue of measuring inequality of equivalent incomes is their weighting in the aggregate inequality measures. Danziger and Taussig (1979) argued that distributional weights must be chosen independent of the equivalence scale and stated a preference for using the number of individuals rather than the number of households for calculation inequality measures. Counting each household member as one person, viz. assigning the appropriately calculated equivalent income to each household member, seems the evident extension of inequality measurement when switching from homogeneous to heterogeneous households. An A2C1 household with a total household income of 44,000 € is transformed to 3 (adult-equivalent) persons with an equivalent income

of 20,000 € if the relative equivalence scale value is 2.2. This aggregation procedure for inequality measures can also be shown to be consistent with theoretical desiderata, viz., with the principal of symmetric treatment of individuals, or with the principle of independence of base of utility, which would require that the measurement of inequality does not change, if the reference household for the equivalence scaling is changed, e.g., from the A1C0 household to the A2C2 household. But transforming the original household income distribution to a size-weighted equivalent income distribution is incompatible with Ebert's between-type progressive transfers principle. For this principle to hold the aggregation of equivalent household incomes must use fictitious household sizes, which are given by the household equivalence scale. For our A2C1 household this would mean that it is transformed to a synthetic household with 2.2 adults and with a per capita equivalent income of 20,000 € in a needs-weighted equivalent income distribution.⁵ There is a simple intuition for the relevance of the different weighting schemes. On the one hand size weighting leaves the total number of individuals constant when the original household income distribution is transformed into an equivalent income distribution, but it increases the total sum of assigned household incomes. Needs weighting, on the other hand, keeps the total sum of household incomes constant, but reduces the (fictitious) number of individuals in the households. As the principle of progressive transfers requires the total amount of income to be constant, it is intuitively clear that needs weighting is compatible with this principle, whereas size weighting is not.

In an extensive robustness study which used data from 20 OECD countries Bönke and Schröder (2008) show that reranking of inequality does occur when traditional inequality measures are calculated from size-weighted or from needs-weighted equivalent income distributions. But I am also willing to take it as good news that reranking is not a frequent event within the range of plausible parameter values of equivalence elasticities, viz., between 0.3 and 1.0.

4. Concluding Remarks

Do the methodical and technical difficulties associated with inequality measurement highlighted in sections 1, 2 and 3 support Kaplow's provocative view that measuring inequality is an unnecessary task? My answer is a clear no. While it is true that one has to be aware of the theoretical restrictions and the limitations in using inequality measures in welfare analysis, it is also clear that the message of Ebert's paper should be welcome. It tells us that the results of welfare analyses can be translated consistently into equivalent statements on changes in an aggregate distribution of equivalent incomes which covers all individuals living in different household environments. Given the difficulty that economists as well as economically trained policy makers face when they to communicate to the public that policy measures are acknowledged as welfare improving, it might be very helpful in order to gain political support, if the message about expected welfare gains can be transmitted as message about expected inequality reductions.

⁵ The denomination „size-weighted“ versus “needs-weighted“ equivalent income distribution is taken from Bönke and Schröder (2008) although I am not convinced that needs-weighted is the appropriate antipode to size-weighted.

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