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HOUSEHOLD COST FUNCTIONS AND
EQUIVALENCE SCALES

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by

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1. Introduction

In most western countries an increasing attention is devoted to what is frequently called income policy. The fundamental problems center around two issues.

First, what income levels or household cost levels correspond to a state of "poverty", to "get along", to "be reasonably well-off"? Since in most countries a certain responsibility is assumed for the poor, the predominant question is clearly "what is the poverty line?" In a similar way, although less pressing, policy makers try to set income amounts for other levels of well-being. In a cardinal utility[*] (or welfare) context, where utility u is measured numerically, this would amount to the quest for a household cost function (h.c.f.) c(u), that assigns money amounts c to specific welfare levels u. In an ordinal context the value of u does not correspond to a specific welfare level. Hence, not knowing what numerical value u corresponds to a feeling of "poverty" or of being "reasonably well-off", it seems impossible to determine the specific household cost level corresponding to the poverty line, say c(poverty). The same impossibility applies for c(getting along) or c(reasonably well-off).

Second, what is the effect of variations in family size (fs) on household costs. We assume that c = c(u;fs) and we are looking for a family equivalence scale defined by

$$(1) \qquad c(u;fs)/c(u;fs_0) = m(u;fs)$$

where fs_0 is the size of a reference family. We call m a family equivalence scale (f.e.s.). If m depends on u, it is called utility-specific. If not, it is called a general family equivalence scale [cf. Ray (1983)].

In this paper the objectives are to develop a new operational method to derive household cost functions and family equivalence scales.

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[*] We shall use the terms utility and welfare indiscriminately.

The new method compares favorably with some more traditional approaches on the following points:

1. it is intuitively easy to understand
2. is is not based on any model assumptions of an arbitrary and/or paternalistic nature, while it remains an ordinal method
3. the data collection is relatively cheap and easy

The structure of this paper will be as follows. In Section 2 we describe the method. In Section 3 we describe a large sample of households in eight European countries and a small North-American sample, that we use for our empirical illustration. In Section 4 the empirical results are presented. A discussion of the new method and a comparison with more traditional approaches to the problem in the literature is postponed until Section 5, after the new method has been explained. Section 6 concludes.

2. The method

In order to explain the method we need a little experiment of thought. Let us assume for a moment that utility would be cardinal, such that a utility level, numerically specified by u, had an identical emotional meaning to all individuals. Then we could ask people to estimate the household cost amount c(u) needed by them to reach utility level u. More specifically the question would be formulated as:

"What household income would you consider, in your circumstances, to be needed to reach utility level u?"

If there are N households which are asked to answer on such a question, they would answer $c_n(u)$ (n = 1,...,N). If we assume a measurement error ε with the usual properties, we would have $c_n(u) = c(u) + \varepsilon_n$ and a sensible estimate of c(u) would be the average answer $\hat{c}(u)$. If the question would be asked for various u-values, we would be able to estimate c(u) over a range on the u-axis. In a similar way, if we would assume a dependency on family size fs it would be possible to estimate c(u;fs) from the answers $c_n(u;fs)$. In such a way we would have found the h.c.f. and f.e.s. as well.

The obvious problem with this approach is that we do not know whether two respondents attach the same feeling of well-being to a specific u-level. We rarely or never hear someone saying that he evaluates the welfare of his family by a 8 or 4 for example. It is not common language, and hence we cannot assume that different respondents assign the same emotional meaning to such an evaluation degree.
However, things change if we realize that people do evaluate their household welfare level fairly often in terms of "I have a good income", "My income is sufficient", "We are poor". One of the basic presumptions in a language community is that words and verbal expressions have approximately the same emotional meaning and connotation to all members of the language community. Obviously this is not perfectly true; there are many misunderstandings in verbal communications, but it is true to a reasonable extent, witness the use of language as a means of communication in business, court trials and love affairs. It follows that we can have much more faith in the comparability of answers to the above question if we describe the utility level by words than

if we describe it by a real number u. Then the question might run like this:

"What household income would you consider, in your circumstances, to be a good income?"

Let the answer by respondent n be $c(good; fs_n)$. Obviously we can not specify c now as a nice function of u, for u is only defined on a verbal domain, a set of verbal expressions. We can, however, study the behavior of $c(good; fs)$ as a function of fs. Applying equation (1) we would get a utility-specific family equivalence scale $m(good; fs)$. In a similar way we might analyze the responses to a question, where u is set equal to "sufficient", "bad" etc.

There are two problems with this approach.
First, although the argument on the use of a language as an instrument of communication seems convincing, we would like some additional statistical evidence that words like "good" have a similar connotation for different members in a language community. In Section 4 we shall present empirical evidence on this point, from which we shall conclude that comparability may be assumed. At this stage we shall take it for granted.

The second problem may be that the answers of respondents do not only depend on objective factors like family size, but that they also depend on their current income y_n. To give an example, if one's income is 10,000 a year, there is a good chance that he will estimate a good income at 20,000, but if one's income happens to be 50,000 he may estimate a good income at 70,000. It looks as if there is not <u>one</u> income level (for given fs) which can be called a good income, but that to each current income level y there corresponds a $c(good; fs_n, y_n)$. Although this finding is very interesting from a psychological point of view, it does not give an immediate answer to the question what is the level of household cost $\hat{c}(good; fs)$ for a family of size fs, such that <u>that</u> household will qualify its <u>own</u> income as representing a utility level "good". However, it mey be derived in a straightforward manner.

If we know the function $c(good; fs, y)$ we may solve the equation

(2) $\qquad \hat{c}(good; fs) = c[good; fs, \hat{c}(good; fs)]$

for $\hat{c}$. The solution $\hat{c}$(good; fs) gives us a family-size differentiated <u>true</u> household cost in the sense that families with income $\hat{c}$(good; fs) qualify their <u>own</u> utility level as "good". We shall call the function c(.; ., .) a <u>virtual</u> household cost function and $\hat{c}$(.; .) the corresponding <u>true</u> h.c.f.

In a similar way we may derive $\hat{c}$(sufficient; fs) or $\hat{c}$ for any other description of a utility level. The money amounts $\hat{c}$ may be interpreted as a <u>money-metric</u> [see Samuelson (1974), Deaton and Muellbauer (1980)]. The family-equivalence index for any utility level follows automatically from (1), applied on $\hat{c}$.

3. Data

The question posited above has been posed already in a lot of surveys. Since the thirties the Gallup organization asked a question running like

"What is the smallest amount of money a family of four (husband, wife and two children) needs each week to get along in this community?"

see Kilpatrick (1973).

In Goedhart et al. (1977) a related but different question is described, which is sometimes posed in Europe. It runs

"We would like to know which net family income would, in your circumstances, be the absolute minimum for you. That is to say, that you would not be able to make both ends meet if you earned less. In my (our) circumstances I consider the following net family income the absolute minimum:

.... per week/per month/per year (encircle the period)".

The latter question was also included in some recent North American questionnaires. The difference is clearly that the latter question urges the respondent to take his own family as a frame of reference, while the former question by referring to an average family causes confusion, as every respondent will have a different "average" in mind without that the varying frame of reference is explicitized to the researcher.

In Goedhart et al. (1977) the latter question has been analyzed for Dutch data. In Colasanto (1983) and Danziger et al. (1984) similar analyses have been performed on American data.

This author introduced in 1971 the so-called Income Evaluation Question (IEQ) which is a composite question[*] running as follows:

"Please try to indicate what you consider to be an appropriate amount for each of the following cases? Under my (our) conditions I would call a net income per week/month/year of:

about .... very bad

about .... bad

about .... insufficient

about .... sufficient

about .... good

about .... very good

Please enter an answer on each line, and underline the period you refer to".

The respondent is asked to specify the period, in order that every respondent chooses his own period of reference. The latter question has been posed in a score of large-scale surveys all over Europe, the size of which varied between 1,000 and 2,000 respondents per country.

The typical procedure of collecting the information was mainly dictated by strict financial conditions. Mostly the respondents have been asked at the end of a general oral interview whether they would like to file out a trailer-questionnaire to be returned by mail. The response rate was about 50%. At some occasions the question has been asked in an oral interview and then the response rate was about 90%, where the question is considered to be answered if at least three utility levels were specified. The IEQ is also posed in two surveys in the U.S.A. [see Colasanto et al. (1984) and Van Praag et al. (1984)].

In this paper we shall use a European data set which was collected in 1979 by means of a trailer-questionnaire, except for Ireland and Italy where an oral interview was used. [see also Van Praag et al. (1982) and Hagenaars, Van Praag

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[*] Actually the wording and the number of levels changed a little bit over the years.

(1985)].

The sample used here consists of 13,428 households and it covers the countries of the European Community except the Grand Duchy of Luxembourg and Greece, which was not a member of the E.C. in 1979. Moreover we use a small sample from the Boston area, drawn in the spring of 1983, which has been made available to us by courtesy of Stephen Dubnoff [see also Van Praag et al. (1984)]. The last sample is added just for illustration and to demonstrate that results on American data do not differ that much from that on European data, but it is not representative for the U.S.A. It has been created by Dubnoff with support of the N.S.F. for methodological research only. As it is non-representative and much smaller than the other samples the American figures should be taken with some caution.

4. Empirical results

Let the six income levels answered by respondent n be denoted by $\{c_{in}\}_{i=1}^{6}$ then we shall estimate the following six regression equations

$$(3) \qquad \ln c_{in} = \beta_{oi} + \beta_{1i} \ln fs_n + \beta_{2i} \ln y_n + \varepsilon_{in} \qquad (i = 1,\ldots,6)$$

where we assume the error terms ε_{in} to be i.i.d. and distributed $N(0,\sigma^2)$.*

We anticipate the coefficients β_{1i} to be positive, as a rise in family size will increase needs as explicited by c_{in}. The coefficient β_{2i} should be positive as we expect that people with a low current income will express smaller income needs than people with a high income. The log-linear expression as such is strongly suggested by earlier work, that will be discussed in the next section.

In Table 1 we present the regression results for the six levels for the nine countries separately. At first let us consider the statistical quality. It is seen that almost all coefficients are highly significant. The multiple correlation coefficients, being in the order of 0.5 or more, are exceptionally high for large samples of micro-data. So it appears that (3) provides a structural explanation of the answers to the IEQ. Indirectly, as an argument a contrario, this also supports our hypothesis that qualifications like "good" or "bad", used in the IEQ, convey approximately the same emotional connotation to all respondents. For, if all people would assign a randomly varying, haphazard connotation to the same wording the resulting responses c_{in} could not be structurally explained to such an extent as Table 1 exhibits by two intuitively plausible factors.

Table 1 is very interesting as well from an economic (and psychological) point of view. At first consider β_{11} to β_{16}. It is a non-increasing sequence for most countries (except Ireland and the U.S.A.). β_{1i} stands for the family size influence on money income needed in order to reach a welfare level i. We see that at the bottom welfare level, where only bare necessities are bought, a

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* This may also be seen as a case of "seemingly unrelated regressions" [Zellner (1962)].

family size effect is found, that is frequently twice as strong as at the top welfare level, that is associated with sheer luxury. The interpretation is obvious: at the bottom we have to think on first priorities like food and clothing, and those expenditure categories are strongly related with family size. At the top this relationship is much weaker, as we bother then on buying a luxurious house or a yacht. Second, it appears that there is a strong own-income-dependency at all levels and in all countries. In Van Praag (1971) this phenomenon was called _preference drift_. The preference drift increases in most countries with an increasing welfare level. The existence of preference drift is actually a specific instance of a general phenomenon, studied in psychophysical adaptation theory [e.g. Helson (1964)]. Adaptation theory states that people relate their judgements on the brightness of light, the loudness of sounds, etc., to an "anchor point", a level to which they are accustomed. In this case where income levels are judged the prominent anchor point is own current income. More generally, it shows that income evaluation is a relative affair and is becoming even more relative if one goes from the materially low level of "very bad" to the situation of "very good" where the pertinent choices are mainly of the type of choosing between a Jaguar or a Porsche. The intercepts β_{01}, ..., β_{06} as such cannot be readily interpreted. The equation (3) is a local approximation and it looses all its reality when log-income tends to zero.

Applying (2) on (3) we may now derive the _true_ household cost levels

$$(4) \qquad \hat{c}(i; fs) = \exp\left[(\beta_{0i} + \beta_{1i} \ln fs)/(1 - \beta_{2i})\right]$$

In Table 2 true household cost levels are presented for the six levels in the nine countries for a reference family of four persons. All amounts are after-tax incomes expressed in Dutch guilders (equalling 0.5 U.S. dollar), referring to the Fall of 1979. For the U.S.A. the figures refer to after-tax incomes in 1983. For this European author the upper extreme for America looks rather high, but it cannot be denied that income inequality in the U.S.A. is much more pronounced, and what is perhaps even more important, the high incomes of rich people are published in the press without much reluctance. This leads perhaps to much higher estimates than in a more discrete Europe, where there is almost total public silence on incomes. Finally we recall our earlier caveat on the American sample.

TABLE 1. Equation (4) estimated for 9 countries at 6 levels

Belgium (N = 1100)

Level	β_0	β_1	β_2	R^2
1	4.92	0.14	0.43	0.34
	(0.26)	(0.03)	(0.03)	
2	4.70	0.13	0.47	0.44
	(0.23)	(0.02)	(0.02)	
3	4.50	0.12	0.51	0.50
	(0.21)	(0.02)	(0.02)	
4	4.31	0.10	0.56	0.55
	(0.20)	(0.02)	(0.02)	
5	4.05	0.08	0.60	0.57
	(0.20)	(0.02)	(0.02)	
6	3.85	0.07	0.64	0.53
	(0.23)	(0.02)	(0.02)	

Denmark (N = 1746)

Level	β_0	β_1	β_2	R^2
1	2.43	0.11	0.70	0.65
	(0.15)	(0.02)	(0.02)	
2	2.30	0.10	0.73	0.75
	(0.13)	(0.01)	(0.01)	
3	2.17	0.09	0.76	0.80
	(0.11)	(0.01)	(0.01)	
4	2.41	0.09	0.75	0.80
	(0.11)	(0.01)	(0.01)	
5	2.95	0.09	0.71	0.75
	(0.12)	(0.01)	(0.01)	
6	3.32	0.08	0.70	0.66
	(0.15)	(0.02)	(0.01)	

France (N = 1968)

Level	β_0	β_1	β_2	R^2
1	4.43	0.10	0.49	0.45
	(0.15)	(0.02)	(0.02)	
2	4.41	0.09	0.52	0.52
	(0.13)	(0.01)	(0.01)	
3	4.23	0.07	0.56	0.57
	(0.13)	(0.01)	(0.01)	
4	4.45	0.06	0.56	0.57
	(0.13)	(0.01)	(0.01)	
5	4.63	0.03	0.57	0.53
	(0.13)	(0.01)	(0.01)	
6	4.84	−0.00	0.57	0.41
	(0.17)	(0.02)	(0.02)	

W-Germany (N = 1467)

Level	β_0	β_1	β_2	R^2
1	3.50	0.12	0.57	0.40
	(0.23)	(0.02)	(0.02)	
2	3.34	0.11	0.60	0.53
	(0.18)	(0.02)	(0.02)	
3	3.44	0.11	0.61	0.58
	(0.17)	(0.02)	(0.02)	
4	3.53	0.09	0.63	0.61
	(0.16)	(0.01)	(0.02)	
5	3.79	0.08	0.62	0.59
	(0.16)	(0.01)	(0.02)	
6	4.14	0.06	0.62	0.48
	(0.20)	(0.02)	(0.02)	

Ireland (N = 871)

Level	β_0	β_1	β_2	R^2
1	3.00 (0.22)	0.12 (0.02)	0.62 (0.02)	0.57
2	3.62 (0.19)	0.12 (0.02)	0.58 (0.02)	0.61
3	3.80 (0.19)	0.13 (0.02)	0.57 (0.02)	0.63
4	4.20 (0.19)	0.12 (0.02)	0.56 (0.02)	0.59
5	4.38 (0.21)	0.11 (0.02)	0.57 (0.02)	0.57
6	4.48 (0.23)	0.10 (0.02)	0.58 (0.02)	0.52

Italy (N = 1753)

Level	β_0	β_1	β_2	R^2
1	4.58 (0.20)	0.17 (0.02)	0.43 (0.02)	0.29
2	5.15 (0.15)	0.15 (0.02)	0.40 (0.02)	0.36
3	5.54 (0.14)	0.15 (0.02)	0.39 (0.01)	0.41
4	5.65 (0.13)	0.15 (0.01)	0.41 (0.01)	0.46
5	5.67 (0.13)	0.11 (0.02)	0.44 (0.01)	0.45
6	5.41 (0.16)	0.10 (0.02)	0.50 (0.02)	0.40

Netherlands (N = 1788)

Level	β_0	β_1	β_2	R^2
1	4.92 (0.18)	0.16 (0.01)	0.44 (0.02)	0.38
2	4.59 (0.15)	0.13 (0.01)	0.49 (0.01)	0.49
3	4.14 (0.14)	0.12 (0.01)	0.55 (0.01)	0.57
4	3.77 (0.13)	0.10 (0.01)	0.61 (0.01)	0.61
5	3.45 (0.14)	0.08 (0.01)	0.66 (0.01)	0.61
6	3.24 (0.17)	0.06 (0.01)	0.71 (0.02)	0.54

United Kingdom (N = 1146)

Level	β_0	β_1	β_2	R^2
1	5.08 (0.27)	0.20 (0.03)	0.39 (0.03)	0.21
2	4.90 (0.24)	0.18 (0.03)	0.44 (0.02)	0.28
3	4.62 (0.21)	0.15 (0.02)	0.49 (0.02)	0.37
4	4.51 (0.31)	0.13 (0.02)	0.53 (0.02)	0.40
5	4.40 (0.22)	0.08 (0.02)	0.56 (0.02)	0.38
6	4.50 (0.28)	0.03 (0.03)	0.58 (0.03)	0.28

U.S.A. Boston Area (N = 470)

Level	β_0	β_1	β_2	R^2
1	2.83 (0.34)	0.12 (0.04)	0.66 (0.03)	0.56
2	3.50 (0.26)	0.13 (0.03)	0.62 (0.03)	0.65
3	3.29 (0.22)	0.13 (0.02)	0.67 (0.02)	0.75
4	3.42 (0.22)	0.09 (0.02)	0.69 (0.02)	0.75
5	3.94 (0.27)	0.08 (0.03)	0.66 (0.03)	0.65
6	4.24 (0.38)	0.08 (0.04)	0.66 (0.04)	0.48

TABLE 2. True Annual Household Cost Levels (1979) in D.Fl.*
(for a 4-persons household)

Levels	Countries Belgium	Denmark	France	W-Germany	Ireland	Italy	Netherlands	United Kingdom	Boston Area (1983)
1	7,715	5,339	7,795	4,730	3,970	4,667	9,619	6,785	6,720
2	10,416	8,037	11,694	6,912	7,502	8,161	12,026	9,172	16,071
3	14,065	12,228	17,394	10,518	10,801	12,273	14,836	12,204	36,894
4	22,265	25,976	31,683	17,820	19,882	20,117	22,726	19,778	92,478
5	34,606	50,378	49,739	31,614	34,255	33,902	37,223	31,549	149,406
6	65,472	96,401	85,688	60,430	63,336	66,685	80,795	55,531	361,051

* All amounts are after-tax incomes in Dutch guilders, net of family allowances.
In October 1979 the American dollar was about two Dutch guilders, in Spring 1983 the American dollar was about Dfl. 2,70.

13

TABLE 3. Family equivalence scales (base fs=4)

Belgium (N = 1100)

Level	fs=2	fs=3	fs=5	fs=6
1	0.84	0.93	1.06	1.10
2	0.84	0.93	1.06	1.11
3	0.84	0.93	1.06	1.11
4	0.86	0.94	1.05	1.09
5	0.87	0.95	1.04	1.08
6	0.88	0.95	1.04	1.08

Denmark (N = 1746)

Level	fs=2	fs=3	fs=5	fs=6
1	0.78	0.90	1.08	1.16
2	0.77	0.90	1.09	1.16
3	0.77	0.90	1.09	1.16
4	0.79	0.90	1.08	1.15
5	0.80	0.91	1.07	1.14
6	0.82	0.92	1.07	1.12

France (N = 1968)

Level	fs=2	fs=3	fs=5	fs=6
1	0.87	0.94	1.05	1.08
2	0.88	0.95	1.04	1.07
3	0.89	0.95	1.04	1.07
4	0.91	0.96	1.03	1.06
5	0.95	0.98	1.02	1.03
6	1.00	1.00	1.00	1.00

W-Germany (N = 1467)

Level	fs=2	fs=3	fs=5	fs=6
1	0.82	0.92	1.06	1.12
2	0.82	0.92	1.07	1.12
3	0.82	0.92	1.07	1.13
4	0.84	0.93	1.06	1.11
5	0.87	0.94	1.05	1.08
6	0.90	0.96	1.04	1.07

Ireland (N = 871)

Level	fs=2	fs=3	fs=5	fs=6
1	0.81	0.92	1.07	1.13
2	0.82	0.92	1.06	1.12
3	0.81	0.92	1.07	1.13
4	0.83	0.93	1.06	1.11
5	0.83	0.93	1.06	1.11
6	0.84	0.93	1.06	1.10

Italy (N = 1753)

Level	fs=2	fs=3	fs=5	fs=6
1	0.81	0.92	1.07	1.13
2	0.84	0.93	1.06	1.11
3	0.84	0.93	1.06	1.11
4	0.84	0.93	1.06	1.11
5	0.87	0.94	1.05	1.08
6	0.87	0.95	1.04	1.08

Netherlands (N = 1788)				
Level	fs=2	fs=3	fs=5	fs=6
1	0.82	0.92	1.06	1.12
2	0.84	0.93	1.06	1.11
3	0.83	0.93	1.06	1.11
4	0.84	0.93	1.06	1.11
5	0.85	0.94	1.05	1.10
6	0.86	0.94	1.05	1.09

United Kingdom (N = 1146)				
Level	fs=2	fs=3	fs=5	fs=6
1	0.79	0.91	1.08	1.15
2	0.80	0.91	1.07	1.14
3	0.82	0.92	1.07	1.12
4	0.83	0.93	1.06	1.11
5	0.87	0.95	1.04	1.08
6	0.95	0.98	1.02	1.03

U.S.A., Boston area (N = 470)				
Level	fs=2	fs=3	fs=5	fs=6
1	0.78	0.90	1.08	1.15
2	0.79	0.91	1.08	1.15
3	0.76	0.89	1.09	1.17
4	0.82	0.92	1.06	1.12
5	0.85	0.93	1.05	1.10
6	0.85	0.93	1.05	1.10

In a similar way we may now calculate the utility-specific f.e.s. m(i; fs) as

$$(5) \qquad \hat{c}(i;\ fs)/\hat{c}(i;\ 4) = \exp\ [\beta_{1i}(\ln\ (fs/4)/(1 - \beta_{2i})] = m(i,\ fs)$$

The values of m(i; fs) are tabulated for the six levels and the eight
countries in Table 3. We see that they typically range from 0.80 to 1.10,
although the variation is somewhat more at the lower end of the scale. For
practical purposes it seems acceptable to use an average general index which
may be taken to correspond with the third welfare level.
A peculiar problem which we shall not try to correct for here, but which is
certainly important if the method outlined here is refined for political
applications is caused by the existence of family allowances in most
countries. We observe, that they are mainly not included in the monthly
payment by the employer. Also they are frequently paid quarterly instead of
monthly or weekly. It follows that the responses to the IEQ are probably given
in terms of regular payment, that is after-tax household income net of family
allowances, but that the answers are nevertheless tacitly conditioned by the
prevailing family allowance. It implies that the household cost estimates are
in terms of net income (where family allowances are ignored), but given the
fact that the state pays a family allowance in addition to it. If family
allowances, mostly proportional to family size, are added to the reported
household cost estimates, it follows that the resulting household cost amounts
are somewhat higher and that the f.e.s. becomes somewhat more pronounced at
lower levels of welfare.

5. Discussion and evaluation

As the method outlined above is rather novel it deserves a somewhat broader discussion than usual. It seems useful to split the discussion into two parts. First, we compare this method with the classical and neo-classical methods known in the literature. Second, we compare the method to earlier work by this author, Kapteyn and others.

In the literature we find several approaches varying in degree of sophistication.

1. The first approach is what may be called the underlined political approach. Politicians and/or experts like nutritionists and sociologists describe a level of well-being in physical terms, e.g. a state of poverty. Second, they define an income level needed to reach that level. Third, they define an equivalence scale.
   This method which is most popular when applied to the state of poverty, is followed for instance by writers like Townsend (1979), Rowntree (1901), and Orshansky (1965), on whose work the official U.S. poverty line is based.

   This method is rather aprioristic. Although it may be and frequently is based on empirical observations, before the experiment is performed it is already known what are the criteria of poverty (or any other state of well-being). If there is agreement on what "poor" is, then the method may be excellent for counting the poor, but it does not help us to define poverty to begin with. That has already been agreed upon before the study started [see also Hagenaars, Van Praag (1985)]. Similar observations hold for the construction of equivalence scales. They are given to begin with. The approach may be honorable for political purposes, and like many intuitive methods may not be too far off from results derived by sophisticated empirical methods, but from the point of positive science they are not very relevant.

2. The second approach in this field is what may be called the Engel approach, recently stressed by Muellbauer (1977). Its main idea is that the foodshare W_f in a household budget, which decreases monotonically with increasing income according to Engel's Law, may be considered as a utility index.

Consider then $W_f(y; fs)$ or rather its inverse $y(W_f; fs)$. It may be seen as a household cost function, where the degree of household welfare is described by the foodshare. So we might speak of a welfare level corresponding to a foodshare of 1/3 as rather poor and of a level corresponding to a foodshare of 1/6 as rather well-to-do. The utility-specific f.e.s. is defined by

$$m(w_f; fs) = \frac{y(w_f; fs)}{y(w_f; 4)}.$$

In this approach there is a basic difficulty of the ordinal/cardinal type. Actually w_f is a cardinal utility measure and the question is whether we accept that cardinalization as meaningful? The question boils down to the issue whether w_f unambiguously describes a situation which has the same emotional meaning of hardship to most citizens. Personally, I am willing to go along with this idea if we consider a population where the households acquire their consumption on the market or, if not, the ratio between market and non-market household consumption is about equal in all parts of the population. This excludes the method for societies where there is a considerable home production in some households and none in others. A similar proviso holds for our own method outlined above.

There are also problems with respect to the technicalities.
First, there is the question "what is food?" Does it cover only cheap bread or also expensive bread, no alcoholic beverages or also beer, wine etc. The definition of "food", and consequently of the food-share involves a lot of arbitrary elements both for the interpretation of the h.c.f. and the resulting f.e.s. If the expenditure category is widened from "food" to "food and clothing" or even larger, it comprises almost everything, and W_f would tend to one. Hence the problem of defining "food" is not irrelevant. If it is defined too narrowly, the results are more or less arbitrary depending on the definition, and if it is taken too widely the foodshare concept does not differentiate any more and its interpretation becomes blurred. The same difficulties are met if one uses the complementary approach, based on the definition of adult goods. [cf. Nicholson (1949)]

The second technical problem is that it is based on income-demand curves that can only be meaningfully derived from a data set on individual

Finally, let us compare these results with earlier work, in which the present author was involved. In earlier work [Van Praag (1971), Van Praag, Kapteyn (1973), Kapteyn, Van Praag (1976)] the answers $\ln c_1, \ldots, \ln c_6$ are used to fit a cardinal utility function. That function was specified as a lognormal distribution function that is

$$U = N\left(\frac{\ln c - \mu}{\sigma}; 0,1\right)$$ where N stands for a standard-normal distribution

function. The parameter μ was estimated per individual t
as $\mu_t = 1/6 \ \Sigma_{i=1}^{6} \ln c_{it}$. Assuming σ to be constant and μ_t to depend on y_t and fs_t according to the relationship

$$(6) \qquad \mu \approx \beta_0 + \beta_1 \ln fs_t + \beta_2 \ln y_t$$

it follows that the constraint $\ln y_t - \beta_0 - \beta_1 \ln fs_t - \beta_2 \ln y_t$ = constant defines the compensation for a change in family size to keep utility of current income constant. This yields results, analogous to those in Section 4. From the results in this paper it follows actually that the cardinal context, which has been used in earlier work, is not needed at all in order to derive results on equivalence scales. It follows that all previous results [see also Goedhart et al. (1977), Van Praag et al. (1980, 1982)] could have been derived in an ordinal context as well. Then the effects there derived have to be interpreted as "average" effects, since μ is actually the average of $\ln c_1, \ldots, \ln c_6$ and addition of the six equations

$$(7) \qquad \ln c_{it} = \beta_{0i} + \beta_{1i} \ln fs_t + \beta_{ci} \ln y_t \qquad\qquad (i = 1, \ldots, 6)$$

and division by 6 yields

$$\mu_t = 1/6 \ \Sigma_{i=1}^{6} \ \beta_{0i} + 1/6 \ \Sigma \ \beta_{1i} \ln fs_t + 1/6 \ \Sigma \ \beta_{2i} \ln y_t$$

$$= \beta_0 + \beta_1 \ln fs_t + \beta_2 \ln y_t$$

This ordinal re-interpretation of equivalence scales based on μ may also be applied on the first results on μ derived for a North-American sample [Colasanto et al. (1984)], which appear to be very similar to those derived for European data sets [see also Danziger et al. (1984)].

6. Conclusion

Summarizing the paper, it seems that a very general, easy and not costly method has been found to derive family equivalence scales and h.c.f. that involves less postulates than traditional methods, while in the same time remaining ordinal. The results are pretty stable all over Europe. In three American surveys [viz. Colasanto (1983), Van Praag et al. (1984) and Danziger et al. (1984)] similar results have been found. The advantages mentioned before and all this empirically consistent evidence point in the direction of further research which will have as a necessary prerequisite the introduction of the IEQ in household surveys as a routine question [see also Danziger et al. (1984)].

It is obvious that the IEQ-answers may also be used to derive other equivalence scales (e.g. for health status, and climate) and that they offer interesting material for the study of reference behavior as answers on the IEQ are obviously depending on norms in the reference group of the respondents. In a panel-survey context they may be used to investigate habit formation. We refer to Van Praag (1984), Van Praag et al. (1984), Van Praag, Van Weeren (1984) and Van de Stadt et al. (1984).

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