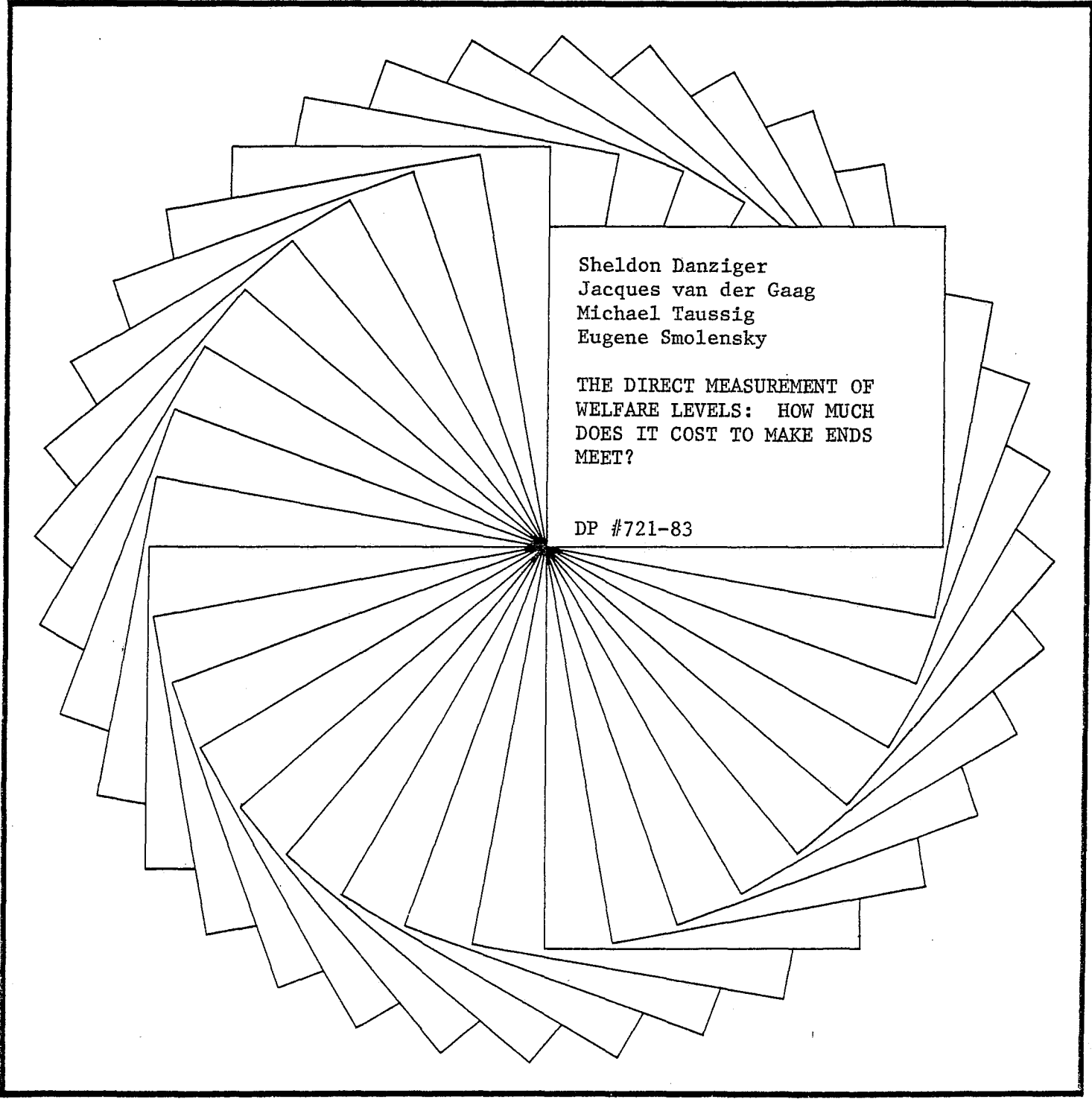# IRP Discussion Papers

Sheldon Danziger
Jacques van der Gaag
Michael Taussig
Eugene Smolensky

THE DIRECT MEASUREMENT OF
WELFARE LEVELS: HOW MUCH
DOES IT COST TO MAKE ENDS
MEET?

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The Direct Measurement of Welfare Levels:
How Much Does It Cost to Make Ends Meet?

Sheldon Danziger*
Jacques van der Gaag**
Michael K. Taussig***
Eugene Smolensky*

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*University of Wisconsin-Madison
**The World Bank
***Rutgers University

ABSTRACT

We adopt a direct approach to measuring the welfare levels of house-holds with different incomes and varying characteristics by using households' responses to subjective questions about their evaluations of their own economic status. We use this approach to analyze newly available U.S. data on subjective well-being. We address such interre-lated questions as how to rank households by welfare level, how to make comparisons of households of different size and composition, and how to establish a set of poverty lines.

Two differences between our empirical results and those using the official poverty lines stand out. First, the equivalence scale derived from the subjective data shows small differences in needs for households with an aged head and for larger families and large differences for households headed by females. This pattern is reversed in the official poverty lines. Second, the income level associated with making ends meet lies considerably above the U.S. poverty level.

1. INTRODUCTION

One of the most difficult and important problems for economists is the measurement of welfare (or utility) levels. Its importance stems from the fact that economic agents under consideration (individuals, households, firms, governments) are assumed to maximize a utility function under some budget constraint. The theoretical variable "utility" (or welfare), however, is unobserved and empirical work has to rely upon the observed behavior of the agents: their expenditures at given market prices, hours worked at given wage rates, etc. Welfare comparisons, then, have to be derived from an indirect, revealed preference approach.[1]

In this paper, we adopt a direct approach to measuring the welfare levels of households with different incomes and varying characteristics. We make use of households' responses to what are frequently and pejoratively called "subjective" questions about their evaluations of their own economic status. Such questions can take various forms, but always attempt to associate an objective money income level with a household's prespecified subjective welfare level. This subjective approach originated with sociologists, but two recent papers (van Praag et al., 1980 and 1982) have used it to derive poverty lines for the countries of the European Community. This paper is the first to use this approach to analyze newly available U.S. data on subjective well-being. We address such interrelated questions as how to rank households by welfare level, how to make comparisons of households of different size and composition, and how to establish a set of poverty lines.

In Section 2, we describe the direct (revealed preference) approach to measuring welfare levels, relate the subjective approach to it, and

show thereby that it is consistent with economic theory. Section 3 describes the data, presents our results, and compares them with the results of alternative approaches. Section 4 draws conclusions.

2. TWO APPROACHES TO MEASURE A HOUSEHOLD'S WELFARE LEVEL

Let $u(\cdot)$ be a welfare index, defined over a commodity space, and q be a vector of commodities. A household is assumed to choose that q which maximizes its utility, subject to a budget constraint. Thus, the maximization problem reads

$$\text{maximize } u = u(q) \tag{1}$$

$$\text{subject to } p'q = C \tag{2}$$

with p, a vector of prices, and C, the total expenditures or income. The solution of this problem yields

$$q = q(p, C), \tag{3}$$

a set of demand equations, showing that the demand for each of the commodities is a function of all prices and income. Substituting (3) into equation (1) gives

$$u = u(q(p, C)) = v(p, C), \tag{4}$$

the maximal attainable utility level when total income is C and prices are p. Solving equation (4), the indirect utility function, for total expenditures C, yields the cost function:

$$C = C(u, p). \tag{5}$$

It is irrelevant for empirical purposes whether we have the information to obtain the cost function, the direct or the indirect utility functions, or the demand functions. In practice, since consumption data are what is available, empirical work starts with equation (3): observations on consumption behavior are used to assess welfare levels, by first estimating the demand equations.

Empirical work need not be restricted to analyzing equation (3). From the demand equations and equation (4), the cost function, which answers the question, "How much income is needed to reach welfare level u?, can be obtained. The same sort of question has repeatedly been asked by sociologists. For instance, for many years, the Gallup Poll has asked:

> "What is the smallest amount of money a family of four
> needs to get along in your community?"

In this question, "to get along" is a verbalization of a specific utility level, and the question can be interpreted as evaluating equation (5), the cost function, for the utility level "getting along."[2]

Both the revealed preference and subjective utility approaches can be made more realistic. For example, the revealed preference approach can easily be extended to allow for differences in household composition. Assume that households maximize the function

$$u = u(q;h) \qquad\qquad (6)$$

subject to the budget constraint (2). The utility function is now specified as conditional upon a vector of household characteristics h, and the demand equations and the cost function now read

$$q = q(p, C; h) \qquad\qquad (7)$$

$$C = C(u, p; h) \qquad\qquad (8)$$

A similar development is open to the analysis of subjective responses. For example we can analyze household responses to the following question:

> "Living where you do now and meeting the expenses you consider necessary, what would be the very smallest income you (and your family) would need to make ends meet?"

This question, included in the sixth wave of the 1979 Income Survey Development Program (ISDP) Research Panel (of the Social Security Administration), is a variant of the Minimum Income Question, first analyzed by Goedhart et al. (1977). It differs from the Gallup Poll question in that it refers directly to the respondent's own family situation, rather than to a hypothetical family of four. Thus family size varies across the respondents and the role of differing family size can be measured statistically. Hence, we interpret the ISDP question as an attempt to measure equation (8), for the welfare level "making ends meet." Consequently, our estimation results enable us, among other things, to construct true—i.e., constant utility—household equivalence scales (Muellbauer, 1974).

Let $C^0 = C(u^0; h^0)$ be the income needed by the reference household h^0 to attain utility level u^0. Then

$$C(u^0; h)/C(u^0; h^0) \qquad\qquad (10)$$

is the equivalence factor that "compensates" the income of a household with characteristics h, to make it equivalent to that of the reference household.[3]

Following Goedhart et al. (1977), we postulate that the response to

the "making ends meet" question is systematically influenced by the

respondent's current income level and family composition:

$$Y^* = f(Y, fc), \qquad (11)$$

with Y*, the response to the Minimum Income Question,

   Y, income, and

   fc, family composition.

We can define the "true" income level associated with the welfare

level "making ends meet" as the solution to

$$\overline{Y} = f(\overline{Y}, fc), \qquad (12)$$

i.e., if indeed the response to the question is systematically influenced

by the respondent's own income level, only those respondents with just

enough income "to make ends meet" will, on average, give the "correct"

answer.[4]

In the next section, we estimate equation (11) and use equation (12)

to derive household equivalence scales.

3. DATA AND ESTIMATION RESULTS

3.1 The Basic Regression

The sixth wave of the ISDP Research Panel asked the Minimum Income

Question of one-third of the sample, 3160 households. Of that group,

2671 households, 84.5 percent, answered a dollar amount. Income data

are from the fifth wave. After eliminating all households for whom

income or relevant household characteristics were missing, those for whom

a match between the fifth and sixth waves was not possible, and those not

stating specifically whether their response was gross or net of taxes,

our sample reduced to 2464 households.[5]

Equation (11) was estimated in a log-linear form. Family com-

position is represented by family size, fs, and income by reported

monthly cash income net of federal income and payroll taxes, Y. The

results are as follows:

$$Ln\ Y^* = \underset{(46.8)}{3.94} + \underset{(29.0)}{.376}\ Ln\ Y + \underset{(15.8)}{.351}\ Ln\ fs \qquad (13)$$

$$R^2 = .441,\ N = 2464$$

(t-values in parentheses)

Based on this regression, we solve equation (12) to derive the true

income level associated with "making ends meet" for a family of four.

This yields $\overline{Y}$ = $1208, net of taxes, per month.

Kilpatrick (1973) used the mean response to the Gallup Poll question

to obtain an income elasticity of the poverty line. His estimates range

from .55 to .66. Goedhart et al. estimate an income elasticity of .60,

while van Praag's estimates range from .22 to .63. Our result, .376,

falls in this range but is on the low side. However, our estimate of the

family size elasticity generally exceeds the results found in Europe

though it is still within the range of estimates obtained in van Praag

et al. (1980)--(.04 - .38).

That various estimates for the cost of children are obtained in dif-

ferent countries should not come as a surprise. One possible explanation

for this finding may be the high cost of raising children in the United

States compared to the various European countries, where health care,

educational costs, and transportation costs are often more generously subsidized (or provided with no direct charge) by the government.

The estimated coefficient for household size allows us to construct equivalent income levels for households of different sizes. Before we do so, we expand the number of regressors to facilitate comparison with the equivalence scale implicit in the U.S. poverty lines.

3.2 A Comparison with the U.S. Poverty Lines

Until 1981 the U.S. poverty lines were differentiated with respect to family size, the age and sex of the head of the household, and by farm residence. In 1981 the distinctions by sex of head and farm residence were eliminated. In order to test whether these food-consumption-based differences are also perceived by the households themselves, we added the corresponding variables to the basic regression.[6] The estimated results are as follows:

$$\text{Ln } Y^* = 4.4764 + .3327 \text{ Ln } Y + .2078 \text{ Ln } fs - .2889 \text{ age} - .2503 \text{ female}$$
$$\quad\quad (48.6) \quad (25.5) \quad\quad (8.6) \quad\quad (9.2) \quad\quad (8.5)$$

$$(14)$$

$R^2 \quad = .477, \ N = 2464$

Age $\quad = 1$ if head of household is 65 years or over, $= 0$ otherwise

Female $= 1$ if head of household is female, $= 0$ otherwise

The income adjustments for household characteristics are all in the same direction as for the official U.S. poverty lines. The income level, $\bar{Y}$, associated with "making ends meet," increases with family size and is lower for households with aged or female heads. For example, according to our estimates, the income level implicit in equation (12) for a nonaged,

male-headed household of four is $1261. In comparison, it is $659 for an

aged couple and $699 for a single woman with a child. Table 1 presents

the equivalence scale implicit in our estimates for selected categories

of households and compares the results with the equivalence scale impli-

cit in the U.S. poverty lines and with a scale obtained by van der Gaag

and Smolensky (1982) from a complete consumer demand system estimated

using the 1972-73 Consumer Expenditure Survey data.

Three characteristics are important. First, our new scale is rela-

tively flat with respect to family size. For example, the official U.S.

poverty lines imply that nonaged couples need about 50 percent more

income to maintain their standard of living if they have two children;

our estimates imply that they need only an additional 25 percent.

Similar qualitative results have been obtained by Goedhart et al.

(1977), van Praag et al. (1980 and 1982), all based on the response to a

subjective income evaluation question. The results also are very close

to those of van der Gaag and Smolensky (1982) based on revealed pre-

ference. Thus our results augment the substantial evidence that equiva-

lence scales based only on food consumption underestimate the economies

of scale associated with increasing family size.

The new scale and the official U.S. poverty scale are also quite dif-

ferent with respect to age. The poverty-line scale shows a 7-percentage-

point difference between a nonaged and an aged childless couple while

our scale implies a 29-percentage-point difference. Van der Gaag and

Smolensky find a 27-percentage-point difference. Finally, we find

rather large differences in needs depending upon the sex of the head.

Our estimates consistently imply that unrelated females need less income

than do unrelated males.

Table 1

Household Equivalence Scales

Family Size and Composition	Poverty Line[1] Scale, (nonfarm)		ISDP Subjective Scale		van der Gaag/ Smolensky Scale[2]	
	Age of Head		Age of Head		Age of Head	
	<65	65+	<65	65+	<65	65+
1. Male	53	48	65	42	66	40
1. Female	49	47	45	29	50	24
2. Husband, wife	67	60	81	52	84	57
3. Husband, wife, child	80		91		90	
4. Husband, wife, 2 children	100		100		100	
5. Husband, wife, 3 children	118		107		106	
6. Husband, wife, 4 children	132		113		111	

[1]Source: U.S. Department of Health, Education, and Welfare (1976), Table 2.

[2]Source: Calculated from van der Gaag, Smolensky (1982), Table 2.

Note: For each set of equivalence scales, a household with a husband, wife and two children is set to 100.

One should be careful interpreting these results. The differences in estimated minimum incomes between, say, a female head of household with one child and a married couple may not be adequately accounted for by just two variables: family size and sex. More complex specifications of equation (14), including the age of children, may alter these results.[7]

Our discussion thus far has been limited to the differences in the equivalence scales. An additional point is that the income level associated with "making ends meet" lies considerably above the U.S. poverty level.[8] For a nonaged family of four, the 1979 poverty level was a $7355 while the getting along level was $15,132. In fact, the income level associated with "making ends meet" is closer to the median response of $11,596 for a family of four in 1979 obtained from the "getting along" question in the Gallup Polls. (The mean would be higher). The calculated income level for making ends meet is fairly close to the mean income level of the corresponding group, which is well above the current poverty line.

Although the determination of an income level that corresponds to a verbalization of a certain welfare level is of interest in its own right, we think that the direct measurement approach is most useful for making relative welfare comparisons across households in various circumstances.[9] For instance, using the official poverty line, we find that 13.8 percent of the households in our sample are poor. Holding constant this percentage, but replacing the poverty line equivalence scale with the scale obtained from equation (14), markedly alters the incidence of poverty among various socioeconomic groups (see Table 2).[10] Nonaged men have the largest relative increases in poverty incidences

Table 2

Incidence of Subjective Poverty and Offical Poverty, and Sample Means
for Mean Income and Minimum Income Question

Head of Household Is:	Number of Observations	Official Poverty	Subjective Poverty	Mean Monthly Income (Net of Taxes)
White				
Nonaged male	1,564	5.4%	7.2%	$1,787
Nonaged female	232	18.1	21.6	939
Aged male	210	15.2	17.1	1,085
Aged female	163	40.5	18.4	464
Nonwhite				
Nonaged male	142	20.4	26.1	1,231
Nonaged female	97	54.6	50.5	577
Aged male	22	27.3	36.4	1,022
Aged female	34	85.3	50.0	297
All households	2,464	13.8	13.8	1,454

Source: Computations by authors from linking of waves 5 and 6 of ISDP Research Panel.

under our poverty scales, while aged women have the largest decreases. As a result, aged women who comprise 25 percent of poor households officially, comprise only 13 percent subjectively.

4. CONCLUSION

Following two recent publications (van Praag et al., 1980 and 1982), we analyzed the response to a subjective question regarding a minimum income level. We first showed that this new method has a conventional economic interpretation. We then used data from the ISDP research panel to obtain "true" household equivalence scales as defined by Muellbauer (1974). The results are consistent with results obtained by others using the same methodology. They also resemble those obtained using the much more cumbersome (and more expensive) revealed-preference approach.

Our results should be interpreted with caution. First, we used the linear specification of equation (14) only to ease comparison with the European results. Similarly, the inclusion of the age and sex variables was to facilitate comparison with the U.S. poverty-line scales. We expect that many variables besides number of children, age, and sex would influence the response to the Minimum Income Question (e.g., the age of children, employment status of the adults, and such in-kind income items as food stamps and subsidized housing).[11] Nonetheless, we have shown with U.S. data that the direct survey method yields plausible results on the measurement of poverty. The marginal pecuniary cost of including just a few subjective income-evaluation questions in a typically elaborate household survey questionnaire is virtually zero. This paper, like its European counterparts, suggests that the benefits may be considerable.

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NOTES

[1]One of the oldest and simplest examples stems from Engel's work: households are often assumed to be equally well-off if their observed food shares are equal.

[2]Note that in a cross-section context, all households are assumed to face the same prices.

[3]Note that the ratio (10) generally depends on the reference welfare level $u°$, in this paper verbalized as "making ends meet." The particular functional forms chosen by Goedhart et al. and van Praag et al. (1980 and 1982) imply that the welfare ratio is a constant over the entire welfare range. While they estimated the entire cost function, knowledge of just one point on it, as obtained by the Minimum Income Question, is sufficient to perform the analysis.

[4]Goedhart et al. and van Praag et al. (1980 and 1982) use this procedure to define a "true" poverty line.

[5]About two-thirds of the respondents reported an after-tax amount. We converted answers that were gross of taxes to net by estimating federal personal income and payroll taxes on the assumption that all income was wages and that the standard deduction was used.

Elimination of some of the observations may have caused a selectivity problem that we have not attempted to correct. Also, it prevents our using the sample weights provided in the data set.

[6]Farm residence was unavailable to us.

[7]We did estimate several variations of equation (14) by allowing full interaction by age of head (separate regressions for those over and under 65 years of age) by sex of head, and by the use of more detailed family

size dummies. The patterns reported here--small variations by family

size, and large differences by age and sex of head--were robust. The

disaggregated regressions do yield, however, a smaller differential for

aged females, but a larger differential for nonaged females than did the

single equation. As a result, the magnitude of the decline in poverty

incidence for aged females in Table 2 may be overstated.

[8]In Goedhart et al. and subsequent European studies, households

responded to the following question: "In my circumstances, I consider

the following net family income the absolute minimum...." This

reference to an absolute minimum is used by the authors to claim that the

corresponding income level can be viewed as a poverty line.

"Very smallest" in the ISDP version of this question may suggest a higher

level of well-being than "the absolute minimum." In addition, the way

the question was phrased in the ISDP may have caused some confusion about

whether or not taxes were included and whether "living where you do now"

implied staying in the current residence. These differences all may have

caused an upward shift in the responses.

[9]For instance, Deaton (1980) suggests that such a technique can be

used to study the impact of price variation over time on a household's

welfare level.

[10]If we had actually used the dollar values associated with the

making-ends-meet scale, the poverty incidence would have almost doubled,

to 25.6 percent.

[11]If data become available to systematically include in-kind trans-

fers in the analyses of the responses to the Minimum Income Question, the

subjective approach presented here might provide a way to determine the

value placed on these transfers by recipients.