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THE RELATIVITY OF UTILITY: EVIDENCE FROM PANEL DATA

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Abstract—The paper addresses the question whether utility may be viewed as a completely relative concept. In a dynamic setting this means that one has to model both habit formation and utility interdependence. The resulting model contains unobservable variables and requires panel data to be estimated. Using the first two waves of an annual panel in The Netherlands, different specifications of the model are estimated, involving alternative sets of identifying restrictions. It turns out that the data are compatible with the hypothesis that utility is completely relative, but we cannot exclude the possibility that utility is partly relative and partly absolute.

I. Introduction

MOST economic models of human behavior assume that individual utility functions are constant, i.e., not influenced by the behavior of others or by own past behavior. This does not imply that economists building these models necessarily believe in the invariance of utility functions. In fact, papers explicitly defending the invariance of utility are rather scarce, Stigler and Becker (1977) being a notable exception. For most others, constant utility functions may serve primarily as a first approximation or a convenient starting point. Whatever the exact motivation may be, endogenous preferences have not gained a strong foothold in economics, despite a long history of economists acknowledging that preferences are not constant and can be influenced by a variety of variables.[1] In contrast, major parts of psychology and sociology assume the variability of preferences (and opinions, values, norms, etc.) and construct models to explain the variation. These theories come under headings such as relative deprivation theory (e.g., Davis (1959), Runciman (1966)), adaptation level theory (e.g., Helson (1964, 1971)), reference group theory (Hyman and Singer (1968)), etc.

There is a small group of economists who maintain that utility is a completely relative concept, that is, an individual evaluates a bundle of consumption goods by comparing it to the consumption bundles of others, or perhaps to the bundles the individual has consumed in the past. Duesenberry's relative income hypothesis is probably the best known example of a theory that rests on a relative utility concept (Duesenberry (1949)). Before Duesenberry, the Dutch economist Van der Wijk (1939) already hypothesized: "Within a very wide range of incomes, every group in society feels equally poor" (p. 57). In turn, he quotes Marx (1930) as one of the proponents of similar ideas. In more recent times, Easterlin (1974) has provided evidence that the level of income contributes little to one's subjective feeling of well-being, whereas one's *ranking* in the income distribution of a country has a significant effect. At about the same time, Duncan (1975), a sociologist, came to similar conclusions.

One of us (Kapteyn (1977)) has formalized the notion of relative utility into a theory of preference formation. Empirical studies have turned up evidence in favor of the theory (e.g., Van Herwaarden et al. (1977), Kapteyn (1977), Kapteyn et al. (1980), Kapteyn and Wansbeek (1982)). The theory is essentially dynamic, but hitherto only cross-sectional data have been available to test it. In this paper, longitudinal (panel) data are used to investigate the empirical validity of the theory.

The utility concept used in the empirical analysis is the individual welfare function of income due to Van Praag (1968, 1971). It is briefly described in

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[1] A fairly extensive discussion of the economic literature on variable preferences is given by Pollak (1978) and Kapteyn et al. (1980). Additional references are Pigou (1903), Becker (1974), Layard (1980), Rader (1980), and Frank (1982). For reasons of space, no literature overview is attempted here.

section II. The relativity theory, which explains differences in utility functions between different individuals, is presented next (section III). Since the ideas investigated here have been motivated and explained at various places (see the references above), the theory is not presented in its greatest generality, but in a form that corresponds to the data at hand. In section IV the estimating equation is derived. The empirical results are presented and discussed in section V.

II. The Utility Concept

Consider an indirect utility function defined on prices and income.[2] Within a community where individuals can be assumed to face the same prices, the indirect utility function can be taken to be exclusively a function of income. Suppose we are able to observe this indirect utility function for each individual in the community. Partly due to the lack of price variation across individuals, it will generally be impossible to retrieve the corresponding direct utility functions solely on the basis of this information. However, for tests of a relative theory of utility we do not need to know the complete direct utility function per individual. Implications of the theory for differences in direct utility functions between individuals carry over to implications regarding indirect utility functions. If we are thus able to measure indirect utility functions per individual, we may expect to be able to perform at least some tests of a relative utility theory.

In this study we use individually measured utility functions of income, whose theoretical basis is similar, though not identical, to that of an indirect utility function. The concept used is the *individual welfare function of income* (WFI), introduced by Van Praag (1968, 1971). Van Praag assumes that individuals are able to rate income levels on a bounded ratio scale. More specifically, his theory implies that an individual n will evaluate any income y according to his WFI $U_n(y)$, which has approximately the following functional form:

$$U_n(y) \approx \Lambda(y; \mu_n, \sigma_n) \equiv N(\ln y; \mu_n, \sigma_n), \qquad (1)$$

where $\Lambda(\cdot; \mu_n, \sigma_n)$ is the lognormal distribution function with median $\exp(\mu_n)$ and log-variance σ_n^2, and $N(\cdot; \mu_n, \sigma_n)$ is the normal distribution function with mean μ_n and variance σ_n^2. The lognormal distribution function serves here as a purely mathematical description of $U_n(y)$. It does not entail any probabilistic connotation. Yet, its isomorphism with a probability distribution function will be exploited extensively in the sequel. For lack of space we refer to Van Herwaarden and Kapteyn (1981) and Buyze (1982) for details of measurement and tests of Van Praag's hypothesis.

[2] "Income" always means "after-tax family income."

III. Relative Utility

In line with the various theories mentioned in the introduction, Kapteyn (1977) has formulated a theory which assumes that utility is completely relative. For expositions of his so-called theory of preference formation we refer to Kapteyn (1977, 1980) or Kapteyn et al. (1980). Here we shall present only a simplified version which can be tested against the data at hand.

The basic idea is that an individual's WFI is nothing else than a perceived income distribution. That is, an individual evaluates any income level by its ranking in the income distribution that he perceives. To operationalize this idea, we have to explain what is meant by a perceived income distribution. To that end some notation is introduced.

Let there be N individuals in society. Time is measured in years, $t = -\infty, \ldots, 0$, where $t = 0$ represents the present. At each moment of time an individual n $(n = 1, \ldots, N)$ is assumed to assign non-negative *reference weights* $w_{nk}(t)$ to any individual k in society $(k = 1, \ldots, N)$, $\sum_{k=1}^{N} w_{nk}(t) = 1$. The reference weights indicate the importance individual n attaches to the income of individual k at time t. Obviously, quite a few of the $w_{nk}(t)$ will be zero. On the other hand, $w_{nn}(t)$, i.e., the weight that individual n attaches to his own income at time t, may be substantial. The vector $(w_{n1}(t), \ldots, w_{n,n-1}(t), w_{n,n+1}(t), \ldots, w_{nN}(t))$ will sometimes be referred to as n's *social reference group* at time t.[3]

Furthermore, let $y_k(t)$ be the income of individual k at time t. The reference weights now allow for the definition of a *perceived income distribution at time t*. Denote this function by $F_n(y|t)$, then its

[3] The term "reference group" is due to Hyman (1942). The term can have different meanings. Here we use it in the sense of a *comparative* reference group, i.e., the reference group serves as "a standard or comparison point against which the individual can evaluate himself and others" (Kelley, 1947).

definition is

$$F_n(y|t) \equiv \sum_{\{k;\, y_k(t) \le y\}} w_{nk}(t). \tag{2}$$

The $F_n(y|t)$ for any t can be aggregated to one *presently perceived income distribution*, $F_n(y)$. To that end a non-negative *memory function* $a_n(t)$ is introduced, which describes individual n's weighting of perceived incomes over time,

$$\sum_{t=-\infty}^{0} a_n(t) = 1, \qquad n = 1, \dots, N. \tag{3}$$

The presently perceived distribution function $F_n(y)$ can now be defined as

$$F_n(y) \equiv \sum_{t=-\infty}^{0} a_n(t) F_n(y|t). \tag{4}$$

As indicated above, the preference formation theory claims that this perceived income distribution equals the utility function $U_n(y)$ of the individual. It is this claim that we want to shed some light on in this paper.

The development of the argument so far has been in terms of individual incomes, whereas our data refer to family income (cf. the wording of the survey question above). Hence, we reformulate the preference formation theory in terms of incomes per *equivalent adult*. Let $f_k(t)$ be the number of equivalent adults in family k at time t. The income per equivalent adult in this family at time t is denoted by

$$\tilde{y}_k(t) \equiv y_k(t)/f_k(t). \tag{5}$$

The reformulation of $U_n(y)$ in terms of incomes per equivalent adult amounts to a transformation of the income scale: y is replaced by $\tilde{y} \equiv y/f_n$ and e^{μ_n} by e^{μ_n}/f_n.[4] Consequently,

$$\begin{aligned} U_n(y) &= N(\ln y; \mu_n, \sigma_n) \\ &= N\left(\ln\left(\frac{y}{f_n}\right); \mu_n - \ln f_n, \sigma_n\right) \\ &= N(\ln \tilde{y}; \tilde{\mu}_n, \sigma_n) = \tilde{U}_n(\tilde{y}). \end{aligned} \tag{6}$$

Replacing $y_k(t)$ and y in (2) and (4) by $\tilde{y}_k(t)$ and $\tilde{y}$, we obtain the perceived distribution of incomes per equivalent adult $\tilde{F}_n(\tilde{y})$.

The theory of preference formation now states

$$\tilde{U}_n(\tilde{y}) = \tilde{F}_n(\tilde{y}); \qquad n = 1, \dots, N; \;\; \tilde{y} \in (0, \infty). \tag{7}$$

[4] For convenience, we generally omit arguments equal to zero, so $f_n \equiv f_n(0)$, etc.

To investigate the empirical validity of the theory, we derive from (7) implications for variations in μ and σ over individuals, which can be confronted with the data at hand. Denote the first log-moment of $\tilde{F}_n(\tilde{y})$ by $\tilde{m}_n$:

$$\begin{aligned} \tilde{m}_n &= \int_0^{\infty} \ln \tilde{y}\, d\tilde{F}_n(\tilde{y}) \\ &= \sum_{t=-\infty}^{0} a_n(t) \sum_{k=1}^{N} w_{nk}(t) \ln \tilde{y}_k(t). \end{aligned} \tag{8}$$

The equality of the two distribution functions $\tilde{U}_n$ and $\tilde{F}_n$ implies the equality of the first two log-moments:

$$\begin{aligned} \mu_n &= \ln f_n + \tilde{m}_n + \epsilon_n \\ &= \ln f_n + \sum_{t=-\infty}^{0} a_n(t) \sum_{k=1}^{N} w_{nk}(t) \\ &\quad \times \ln \tilde{y}_k(t) + \epsilon_n, \end{aligned} \tag{9}$$

$$\begin{aligned} \sigma_n^2 &= \sum_{t=-\infty}^{0} a_n(t) \sum_{k=1}^{N} w_{nk}(t) \\ &\quad \times [\ln \tilde{y}_k(t) - \tilde{m}_n]^2 + \delta_n, \end{aligned} \tag{10}$$

where measurement errors in μ_n and σ_n^2 and errors in the equations are taken into account by means of the identically and independently distributed (i.i.d.) disturbance terms ϵ_n and δ_n, with zero means and variances σ_ϵ^2 and σ_δ^2.

To facilitate estimation of (9) and (10), a few more assumptions and definitions are needed. We assume that $w_{nn}(t)$ is the same for all individuals and constant over time, i.e., all individuals give themselves the same constant weight. We write $\beta_2 \equiv w_{nn}(t)$ and $\beta_3 \equiv \sum_{k \neq n} w_{nk}(t) = 1 - \beta_2$. The function $\ln f_k(t)$ is specified as $\beta_0 + \beta_1 \ln fs_k(t)$ where $fs_k(t)$ is the number of members of family k at time t. The memory function $a_n(t)$ is assumed to be the same for everyone and is specified as $a_n(t) = (1-a)a^{-t}$. Furthermore, we define

$$\begin{aligned} q_{nk}(t) &\equiv w_{nk}(t)/\beta_3, \qquad k \neq n \\ &\equiv 0, \qquad k = n \end{aligned} \tag{11}$$

$$\overline{m}_n(t) \equiv \sum_k q_{nk}(t) \ln y_k(t), \tag{12}$$

$$\begin{aligned} \overline{h}_n(t) &\equiv \sum_k q_{nk}(t) \ln f_k(t) \\ &= \beta_0 + \beta_1 \Big\{ \sum_k q_{nk}(t) \ln fs_k(t) \Big\} \\ &\equiv \beta_0 + \beta_1 \overline{hs}_n(t), \end{aligned} \tag{13}$$

where $\overline{hs}_n(t)$ is defined implicitly. So, $\overline{m}_n(t)$ and $\overline{hs}_n(t)$ are the log-means of incomes and family sizes in family n's social reference group at time t.

All this makes it possible to rewrite (9) as

$$\mu_n = \ln f_n + (1-a) \times \sum_{t=-\infty}^{0} a^{-t}[\beta_2\{\ln y_n(t) - \ln f_n(t)\} + \beta_3\{\overline{m}_n(t) - \bar{h}_n(t)\}] + \epsilon_n. \quad (14)$$

Using the expression for $\ln f_n$ and applying a Koyck transformation, (14) can be written as

$$\mu_n = [1 - \beta_2(1-a)]\beta_1 \ln fs_n - a\beta_1 \ln fs_n(-1) + \beta_2(1-a)\ln y_n + \beta_3(1-a)\overline{m}_n - \beta_3(1-a)\beta_1\overline{hs}_n + a\mu_n(-1) + \epsilon_n - a\epsilon_n(-1). \quad (15)$$

We observe that (15) has no constant term (the terms in β_0 cancel out). If we allow for the fact that incomes in previous years have to be deflated by a price index it is easy to show that this does not influence the coefficients in (15), but only gives rise to a constant term. In the empirical application (15) has been estimated with a constant term included.

It is rather straightforward to use (10) and derive an expression for σ_n^2 similar to (15). However, that expression is non-linear in both parameters and variables. It will be seen in the next section that estimation of (15), which is non-linear in parameters but linear in variables, is already complicated. Estimation of a similar relation for σ_n^2 would involve problems of measurement errors in a non-linear model. Since we have not yet solved the estimation problems posed by such a model satisfactorily, only (15) will be confronted with the data.

IV. Estimation of the μ_n-equation

The data consist of the first two waves of a panel of 775 households in The Netherlands. The panel survey is conducted by the Netherlands Central Bureau of Statistics. The main breadwinner of each household was interviewed in March 1980 and in March 1981. The items in the questionnaire included questions to measure the respondent's WFI, the after-tax family income, family composition, and a number of demographic and socio-economic characteristics. On the basis of this information (15) is estimated.

The main problem with the estimation of (15) is that $\overline{m}_n$ and $\overline{hs}_n$ are unobservable. To solve this problem we model the reference weights w_{nk} as realizations of a stochastic process. Two assumptions are made about this stochastic process.

The first assumption is that society can be partitioned in *social groups* $G_1, \ldots, G_i, \ldots, G_I$, such that there exist constants P_i satisfying

$$q_{nk} = \begin{cases} P_i/(N_i - 1) + \delta_{nk} & \text{if } n \in G_i, \\ & k \in G_i \\ (1-P_i)/(N - N_i) + \delta_{nk} & \text{if } n \in G_i, \\ & k \notin G_i, \end{cases} \quad (16)$$

where N_i is the number of individuals in group i and where δ_{nk} is an error term with zero mean, distributed independently of all P_i, all incomes and all family sizes in society. Note that

$$E \sum_{k \in G_i} q_{nk} = P_i \qquad \text{if } n \in G_i,\ i = 1, \ldots, I. \quad (17)$$

Thus, P_i is the total reference weight that an individual n in G_i assigns, on average, to the other individuals $k \in G_i$. Assumption (16) therefore states that, on average, individuals within a group G_i give a total weight P_i to others in the same group and a total weight $(1 - P_i)$ to individuals outside their own group.

The second assumption is that the P_i themselves are (realizations of) random variables which are generated according to

$$\frac{1 - P_i}{N - N_i} = \tilde{q} + \Delta_i, \qquad i = 1, \ldots, I, \quad (18)$$

where Δ_i is an i.i.d. random variable with mean zero and variance σ_Δ^2. Since $(1 - P_i)$ is the total weight given to individuals outside group i and $N - N_i$ is the number of individuals outside group i, the interpretation of $\tilde{q}$ is that it is the mean reference weight assigned by individuals to others *outside* their own group.

The first assumption makes it possible to rewrite $\overline{m}_n$ as follows:

$$\overline{m}_n = \sum_k q_{nk} \ln y_k = P_i y_n^* + (1 - P_i)\tilde{y}_n^* + \sum_k \delta_{nk} \ln y_k, \qquad \text{for } n \in G_i, \quad (19)$$

where y_n^* is the mean log-income of individuals in group i, other than n; $\tilde{y}_n^*$ is the mean log-income of individuals outside G_i. Let $\bar{Y}$ be the mean log-income in society, then

$$\bar{Y} = y_n^*(N_i - 1)/N + \tilde{y}_n^*(N - N_i)/N + \frac{1}{N}\ln y_n \quad \text{for } n \in G_i. \quad (20)$$

Next define $\kappa \equiv (N - 1)\tilde{q}$. It is straightforward to show that (18)–(20) imply

$$\begin{aligned} \bar{m}_n = & (1 - \kappa) y_n^* + \kappa \cdot \bar{Y} + \tilde{q}(\bar{Y} - \ln y_n) \\ & + \Delta_i [N \cdot \bar{Y} - (N - 1) y_n^* - \ln y_n] \\ & + \sum_k \delta_{nk} \ln y_k. \end{aligned} \quad (21)$$

According to (18) $\tilde{q}$ is of the order of magnitude of $1/(N - N_i)$, so that $\tilde{q}(\bar{Y} - \ln y_n)$ can be neglected without losing much precision, provided that groups are defined in such a way that $N - N_i$ is large.[5]

Defining

$$\begin{aligned} u_n \equiv & \sum_k \delta_{nk} \ln y_k \\ & + \Delta_i [N \cdot \bar{Y} - (N - 1) y_n^* - \ln y_n], \end{aligned}$$

(21) can then be written as

$$\bar{m}_n = (1 - \kappa) y_n^* + \kappa \cdot \bar{Y} + u_n. \quad (22)$$

We can derive a similar expression for $\overline{hs}_n$:

$$\overline{hs}_n = (1 - \kappa) f_n^* + \kappa \cdot \bar{F} + v_n, \quad (23)$$

where f_n^* is the mean log-family size of families in the group individual n belongs to, excluding his own family, and $\bar{F}$ is mean log-family size in society; a term $\tilde{q}(\bar{F} - \ln fs_n)$ has been neglected.

The assumptions (16) and (18) have thus allowed for very simple operationalizations of $\bar{m}_n$ and $\overline{hs}_n$ by means of (22) and (23). Both $\bar{m}_n$ and $\overline{hs}_n$ are written as convex combinations of a social group mean (y_n^* and f_n^*) and a society mean ($\bar{Y}$ and $\bar{F}$). Whether the operationalization is successful in practice depends on κ. If we are able to find a partitioning into social groups G_i such that κ is close to zero, then reference groups hardly cross the boundaries of the social groups (if $\kappa \approx 0$, $N \cdot \tilde{q} \approx 0$ so $P_i \approx 1$, cf. (18)). In that case, social groups are informative about reference groups. If, on the other hand, for a partitioning into social groups we find that $\kappa \approx 1$, the social groups give no information on reference groups (if $\kappa \approx 1$, $N \cdot \tilde{q} \approx 1$, so $(1 - P_i)/(N - N_i) \approx 1/N$. Hence $P_i \approx N_i/N$, i.e., weights are assigned to social groups roughly in proportion to their share of the population).

In the present application we have partitioned the sample in groups of respondents who have the same education level, the same employment status and who are of about the same age.[6] For these groups we have calculated the sample counterparts of y_n^* and f_n^* for each individual (i.e., within a group the mean log-income and log-family size varies slightly per respondent because the respondent's own income and family size are not part of the definition of y_n^* and f_n^*).[7] The definition of the social groups is partly dictated by the available data, but there is also some evidence in the literature that age, employment and education are important determinants of reference groups.[8]

Inserting (22) and (23) into (15) yields the following estimating equation:

$$\begin{aligned} \mu_n = & [1 - \beta_2(1 - a)] \beta_1 \ln fs_n \\ & - a\beta_1 \ln fs_n(-1) + \beta_2(1 - a) \ln y_n \\ & + \beta_3(1 - a)(1 - \kappa) y_n^* \\ & - \beta_3(1 - a)(1 - \kappa)\beta_1 f_n^* \\ & + a\mu_n(-1) + \gamma_0 + \zeta_n \\ \equiv & (1 - \gamma_2)\beta_1 \ln fs_n - a\beta_1 \ln fs_n(-1) \\ & + \gamma_2 \ln y_n + \gamma_3 y_n^* - \gamma_3 \beta_1 f_n^* \\ & + a\mu_n(-1) + \gamma_0 + \zeta_n \end{aligned} \quad (24)$$

[5] Given that N is the number of families in society, $N - N_i$ will be large as long as the different groups are of comparable size.

[6] Five education levels are distinguished, three employment situations (self-employed, employee, not employed) and five age brackets (less than 30, 30–39, 40–49, 50–65, over 65). This leads to 51 social groups in the sample.

[7] Moreover, $\ln y_n$ and fs_n are explanatory variables in (15), so also including them in the computation of the sample counterparts of y_n^* and f_n^* would introduce unnecessary multicollinearity.

[8] It follows from Festinger's theory of social comparison processes (Festinger, 1954) that people will compare primarily to others who are similar, and a large amount of empirical evidence supports this contention to varying degrees. Borrowing from attribution theory, Goethals and Darley (1977) are able to be more specific about how "similar others" have to be defined. If an individual wants to evaluate a particular ability, he will seek comparison with others who are comparable with respect to attributes related to that ability. For example, a runner will compare her or his performance to the performance of others who are of the same sex, who are of approximately the same age, practice a similar number of hours per week and run in similar circumstances. Translating this to the evaluation of income, people will compare themselves to others whose income generating attributes are similar: employment situation, education and age are then highly relevant attributes (witness the fact that education and age are almost invariably used by economists as predictors in wage equations).

where

$$\gamma_0 \equiv \beta_3(1-a)\kappa(\bar{Y}-\beta_1\bar{F});$$
$$\zeta_n = \epsilon_n - a\epsilon_n(-1) + \beta_3(1-a)u_n - \beta_3(1-a)\beta_1 v_n. \quad (25)$$

The reparameterization in the last member of (24) is given to facilitate the presentation of the results in the next section.

Given the stochastic assumptions introduced so far, the error term ζ_n is uncorrelated with all explanatory variables on the right hand side of (24), except $\mu_n(-1)$. The covariance between $\mu_n(-1)$ and ζ_n is unrestricted and will be estimated.

As a second observation on the stochastic specification of (24), note that replacing y_n^* and f_n^* in (24) by their sample counterparts induces measurement error. Since y_n^* and f_n^* are simply estimated as sample means, the variance-covariance matrix of their measurement errors can be obtained in the usual way. In principle, this covariance matrix is different for different social groups. For simplicity, we have averaged all these matrices and used the result as our estimate of the error variance-covariance matrix for all observations.

Assuming that the random variables involved all follow approximately a normal distribution, (24) can be estimated by means of maximum likelihood. To that end, the LISREL computer program (version IV) has been used.[9]

V. Results and Discussion

We have estimated thirteen different specifications of (24) to bring out the sensitivity of the results to the assumptions made. This follows suggestions by Leamer (1983).

As a bench-mark we present ordinary least squares (OLS) results of a regression of μ_n on the right hand side variables in (24):

$$\mu_n = \underset{(0.031)}{0.066} \ln fs_n - \underset{(0.032)}{0.013} \ln fs_n(-1) + \underset{(0.023)}{0.298} \ln y_n + \underset{(0.029)}{0.072} y_n^* - \underset{(0.025)}{0.032} fs_n^* + \underset{(0.026)}{0.509} \mu_n(-1) \quad (26)$$

number of observations: 775, $R^2 = 0.808$.

All coefficients have the predicted sign. Both habit formation and preference interdependence (represented by the coefficients of $\ln y_n$, y_n^* and $\mu_n(-1)$) contribute significantly to the explanation of μ_n. The coefficient of determination is quite satisfactory, although the main contribution comes from the lagged dependent variable $\mu_n(-1)$.

The remaining twelve specifications can be grouped in two sets. In the first set we treat the measurement errors in y_n^* and f_n^* in the way indicated in the previous section. In the second set of specifications measurement errors in y_n^* and f_n^* are assumed to be absent. For the rest, the six specifications in both sets are pairwise identical. Table 1 presents the results.

Columns A1 and B1 contain the results based on the statistical assumptions spelled out in the previous section. The differences between both columns are generally small. The χ^2-values indicate a satisfactory fit.[10] The parameter estimate most affected by the assumption on the errors in y_n^* and f_n^* is that of κ. Given the high standard errors we can neither exclude the possibility that $\kappa = 0$ nor that $\kappa = 1$. The latter possibility suggests that our definition of social groups may have been a poor one (cf. the previous section).

This is further illustrated by columns A2 and B2, where estimation results are given after imposing $\gamma_3 = 0$, i.e., no effect of y_n^* on μ_n is allowed. Since $\gamma_3 = \beta_3(1-a)(1-\kappa)$, cf. (24), $\gamma_3 = 0$ can be the result of either $\beta_3 = 0$ or $\kappa = 1$ (according to the first row, $a \neq 1$). The values of β_3 and κ in columns A2 and B2 (and A3 and B3) have been computed by assuming $\kappa = 1$ and using $\beta_2 + \beta_3 = 1$. The restriction $\beta_2 + \beta_3 = 1$ is necessary for the identification of β_3. Dropping the restriction, we could equally well assume $\beta_3 = 0$ and leave κ unrestricted. Empirically, both sets of assumptions are equivalent. The restriction $\beta_2 + \beta_3 = 1$ can only be tested if we are willing to impose further restrictions (see below).

The restriction $\gamma_3 = 0$ does not worsen the fit of the model significantly,[11] as could already be ex-

[9] The LISREL-specification and the variance-covariance matrix of the data are available from the authors on request. Write to Arie Kapteyn, Department of Econometrics, Tilburg University, P.O. Box 90153, 5000 LE Tilburg, The Netherlands.

[10] Each specification considered imposes restrictions on the variance-covariance matrix of the observable variables. The χ^2-value for a given specification is minus two times the log-likelihood ratio which tests this specification (the null hypothesis) against the alternative hypothesis that the variance-covariance matrix of the observables is unrestricted.

[11] The difference in χ^2-values between columns 1 and 2 provides the likelihood ratio test statistic (with one degree of freedom) to test the null hypothesis that $\gamma_3 = 0$ against the specification in column 1.

TABLE 1.—ESTIMATION RESULTS

Restriction	Measurement Error[a]					
$\beta_2 + \beta_3 = 1$	yes	yes	yes	—	no	yes
$\gamma_3 = 0$	no	yes	yes	yes	no	no
$\zeta_n = \epsilon_n - a\epsilon_n(-1)$	no	no	yes	yes	no	no
$\gamma_2 = 0$	no	no	no	yes	no	no
$\kappa = 0$	no	no	no	—	yes	yes
Parameter	**A1**	**A2**	**A3**	**A4**	**A5**	**A6**
a	0.833	0.919	0.813	0.972	0.833	0.902
	(0.147)[b]	(0.132)	(0.039)	(0.022)	(0.147)	(0.081)
γ_2	0.109	0.067	0.136	0[c]	0.109	0.068
	(0.088)	(0.087)	(0.029)		(0.088)	(0.051)
γ_3	0.033	0[c]	0[c]	0[c]	0.033	0.028
	(0.039)				(0.039)	(0.043)
β_2	0.657	0.833	0.730	—	0.657	0.703
	(0.140)	(0.302)	(0.083)		(0.140)	(0.240)
β_3	0.343	0.167	0.270	—	0.200	0.297
	(0.140)	(0.302)	(0.083)		(0.196)	(0.240)
κ	0.421	1[c]	1[c]	—	0[c]	0[c]
	(0.502)					
β_1	0.114	0.121	0.112	0.127	0.114	0.120
	(0.039)	(0.039)	(0.038)	(0.037)	(0.039)	(0.038)
σ_ϵ^2	—	—	0.017	0.018	—	—
			(0.001)	(0.001)		
σ_ζ^2	0.029	0.032	—	—	0.029	0.031
	(0.055)	(0.005)			(0.005)	(0.003)
$\text{cov}(\mu(-1), \zeta)$	−0.015	−0.019	—	—	−0.015	−0.019
	(0.007)	(0.006)			(0.007)	(0.004)
χ^2	0.72	1.37	2.18	20.25	0.72	0.96
df	1	2	3	4	1	2

Restriction	No Measurement Error					
$\beta_2 + \beta_3 = 1$	yes	yes	yes	—	no	yes
$\gamma_3 = 0$	no	yes	yes	yes	no	no
$\zeta_n = \epsilon_n - a\epsilon_n(-1)$	no	no	yes	yes	no	no
$\gamma_2 = 0$	no	no	no	yes	no	no
$\kappa = 0$	no	no	no	—	yes	yes
Parameter	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**
a	0.828	0.904	0.812	0.972	0.828	0.908
	(0.144)	(0.132)	(0.039)	(0.022)	(0.144)	(0.076)
γ_2	0.114	0.077	0.137	0[c]	0.114	0.066
	(0.088)	(0.087)	(0.029)		(0.088)	(0.050)
γ_3	0.029	0[c]	0[c]	0[c]	0.029	0.024
	(0.035)				(0.035)	(0.036)
β_2	0.663	0.805	0.729	—	0.663	0.730
	(0.128)	(0.268)	(0.077)		(0.128)	(0.220)
β_3	0.337	0.195	0.271	—	0.170	0.270
	(0.128)	(0.268)	(0.077)		(0.173)	(0.220)
κ	0.500	1[c]	1[c]	—	0[c]	0[c]
	(0.462)					
β_1	0.114	0.120	0.117	0.127	0.114	0.120
	(0.039)	(0.039)	(0.039)	(0.037)	(0.039)	(0.039)
σ_ϵ^2	—	—	0.017	0.018	—	—
			(0.001)	(0.001)		
σ_ζ^2	0.029	0.031	—	—	0.029	0.032
	(0.005)	(0.005)			(0.005)	(0.003)
$\text{cov}(\mu(-1), \zeta)$	−0.15	−0.018	—	—	−0.015	−0.019
	(0.007)	(0.006)			(0.007)	(0.004)
χ^2	0.50	1.14	1.73	19.89	0.50	0.83
df	1	2	3	4	1	2

[a] Variance of error in y_n^* = 0066, variance of error in f_n^* = .0095, covariance of errors in y_n^*, f_n^* = .0016 See the end of section V for an explanation.
[b] Asymptotic standard errors are in parentheses
[c] Restricted

pected on the basis of columns A1 and B1. Thus we cannot reject the possibility that y_n^* has no influence on μ_n. Under the assumption that $\beta_2 + \beta_3 = 1$, columns A1 and B1 would suggest that this is primarily due to a poor choice of social groups, because β_3 differs significantly from zero but κ is not significantly different from one.

In columns A3 and B3 the further restriction is imposed that $\zeta_n = \epsilon_n - a\epsilon_n(-1)$, i.e., in (25) u_n and v_n are zero. Also this restriction is not rejected by the data. Notice that as a result it is possible to estimate σ_ϵ^2. Referring to model (14), $1 - \sigma_\epsilon^2/\text{var}(\mu_n)$ is the proportion of variance in μ_n explained by the theoretical model. We find that $1 - 0.017/0.125 = 0.864$.

In columns A4 and B4 the additional restriction $\gamma_2 = 0$ is imposed. So model (14) can be written as

$$\xi_n(\tau) = a\xi_n(\tau - 1) \tag{27}$$

$$\mu_n(\tau) = \beta_0 + \beta_1 \ln fs_n(\tau) + \xi_n(\tau) + \epsilon_n(\tau), \quad \tau = -\infty, \ldots, 0 \tag{28}$$

where $\xi_n(\tau)$ is an individual specific effect. So $\mu_n(\tau)$ is only influenced by family size and random shocks. For the rest $\mu_n(\tau)$ evolves over time autonomously as described by (27).

If $a = 1$, this model reduces to

$$\mu_n(\tau) = \beta_0 + \beta_1 \ln fs_n(\tau) + \xi_n + \epsilon_n(\tau), \tag{29}$$

i.e., there is no habit formation or preference interdependence. Apart from a correction for family size, the observed value $\mu_n(\tau)$ then fluctuates randomly around the true and constant ξ_n. The possibility that $a = 1$ cannot be rejected within this specification, but the "absolute" specification itself is decisively rejected by the data.

Columns A5 and B5 are just reparameterizations of columns A1 and B1. In A1 and B1, $\beta_2 + \beta_3 = 1$ is a maintained hypothesis. This hypothesis is testable only if we are willing to make additional assumptions; $\kappa = 0$ (no reference weights assigned to people outside one's social group) is one such assumption. Notice that, for $\kappa = 0$, $\beta_2 + \beta_3 = 1$ is equivalent to $\gamma_2 + \gamma_3 + a = 1$. We find that $\gamma_2 + \gamma_3 + a = .976(.045)$ in column A1 and $\gamma_2 + \gamma_3 + a = .972(.046)$ in B1. These numbers do not differ significantly from one. This is confirmed by columns A6 and B6 where the restrictions $\kappa = 0$ and $\beta_2 + \beta_3 = 1$ are imposed simultaneously. The fit does not worsen significantly, so given $\kappa = 0$ we cannot reject $\beta_2 + \beta_3 = 1$, i.e., that utility is completely relative.

In sum, the empirical evidence presented is compatible with a theory implying that utility is completely relative, whereas an absolute utility concept appears to be incompatible with the data. Of course, the data also allow for specifications that make utility partly relative.

To conclude this section, we take the relativity model for granted and discuss the meaning of the parameter estimates. First of all, the estimates of β_2 and β_3 suggest that the total weight which an individual assigns to the incomes of all other people is about half the weight which he gives to his own income (in present and past). This contrasts with earlier results obtained by Kapteyn et al. (1980) who found β_3 to be approximately twice as large as β_2. Apart from data differences, this can be explained by noting that their analysis pertains to holiday expenditures rather than income. The more conspicuous a good, the higher β_3 probably is. Since holidays are among the most conspicuous consumption items, the corresponding β_3 should be substantially higher than for income, which is an aggregate of all consumption possibilities, both conspicuous and unconspicuous ones.

The parameter β_1 measures the increase in a family's cost of living due to an increase in family size. If the size of the family increases by 1% then the cost of living of the family increases by β_1%. The low values of β_1 suggest substantial economies of scale in the operation of a family. In itself it is of interest to see how a purely subjective model provides estimates of seemingly "objective" quantities like cost of living differences. It has been argued elsewhere (e.g., Kapteyn and Van Praag (1980)) that the methodological basis of the present measurement method is identical to the one underlying conventional demand systems approaches to the measurement of differences in cost of living. Although the specification of $\ln f_n$ by $\beta_0 + \beta_1 \ln fs_n$ is very primitive, it is noteworthy that never before in cost of living studies was account taken of both preference interdependence and habit formation.

The estimate of a (approximately 0.83) suggests a fairly strong influence of past income distributions. For instance, weights given to years 0, −1, −2, etc. are 0.17, 0.14, 0.12, 0.10, 0.08, 0.07, 0.06, 0.05, 0.04, 0.03, etc. So the present year receives a weight which is about six times as high as the weight given to an income ten years ago, but all past years combined get a total weight equal to 0.83 as compared to 0.17 for the present year. According to these results, a discussion of the relativity of utility framed exclusively in cross-sectional terms would be highly incomplete.

VI. Conclusion

To the extent that the utility concept used in this paper (the WFI) is a sufficiently close approximation to the indirect utility function defined in economic theory, it seems rather clear that utility functions are subject to preference formation (although, of course, we have in no way "proved" that utility is *completely* relative). This has far reaching consequences for both positive and normative economics. It may be held, of course, that direct questions about satisfaction measure something entirely different from the economic utility concept. Although, on intuitive grounds, we find this hard to accept, further research into the relation between verbal statements about satisfaction and economic behavior is evidently needed.

REFERENCES

Becker, Gary S., "A Theory of Social Interactions," *Journal of Political Economy* 82 (1974), 1063–1091.

Buyze, Jeanine, "The Estimation of Welfare Levels of a Cardinal Utility Function," *European Economic Review* 17 (1982), 325–332.

Davis, James A., "A Formal Interpretation of the Theory of Relative Deprivation," *Sociometry* 22 (1959), 280–296.

Duesenberry, James S., *Income, Saving and the Theory of Consumer Behavior* (Cambridge: Harvard University Press, 1949).

Duncan, Otis D., "Does Money Buy Satisfaction?" *Social Indicators Research* 2 (1975), 267–274.

Easterlin, R. A., "Does Economic Growth Improve the Human Lot? Some Empirical Evidence," in P. A. David and M. W. Reder (eds.), *Nations and Households in Economic Growth. Essays in Honor of Moses Abramowitz* (New York: Academic Press, 1974).

Festinger, Leon, "A Theory of Social Comparison Processes," *Human Relations* 7 (1954), 117–140.

Frank, Robert H., "How Interdependent Preferences Affect Demands for Unobservable and Contingent Goods," Cornell University, mimeo (1982).

Goethals, G. R., and J. M. Darley, "Social Comparison Theory. An Attributional Approach," in J. M. Suls and R. L. Miller (eds.), *Social Comparison Processes* (New York: Hemisphere Publishing Corporation, 1977).

Helson, H., *Adaptation-Level Theory: An Experimental and Systematic Approach to Behavior* (New York: Harper, 1964).

______, "Adaptation-Level Theory: 1970—And After," in M. H. Appley (ed.), *Adaptation-Level Theory: A Symposium* (New York: Academic Press, 1971).

Hyman, H. H., "The Psychology of Status," *Archives of Psychology* 269 (1942), 5–38, 80–86. Reprinted in part in Hyman and Singer (1968), 147–165.

Hyman, H. H., and E. Singer (eds.), *Readings in Reference Group, Group Theory and Research* (New York: The Free Press, 1968).

Kapteyn, Arie, "A Theory of Preference Formation," unpublished Ph.D. Thesis, Leyden University (1977).

______, "A Theory of Preference Formation," MRG Working Paper 7933, University of Southern California (1980).

Kapteyn, Arie, and Bernard M. S. van Praag, "Family Composition and Family Welfare," in J. L. Simon and J. DaVanzo (eds.), *Research in Population Economics* II (Greenwich, CT: JAI Press, 1980), 77–97.

Kapteyn, Arie, and Tom J. Wansbeek, "Empirical Evidence on Preference Formation," *Journal of Economic Psychology* 2 (1982), 137–154.

Kapteyn, Arie, Tom J. Wansbeek, and J. Buyze, "The Dynamics of Preference Formation," *Journal of Economic Behavior and Organization* 1 (1980), 123–157.

Kelley, H. H., "Two Functions of Reference Groups," in G. E. Swanson, T. M. Newcomb and E. L. Hartley (eds.), *Readings in Social Psychology* (1947). Reprinted in Hyman and Singer (1968), 77–83.

Layard, Richard, "Human Satisfactions and Public Policy," *The Economic Journal* 90 (1980), 737–750.

Leamer, Edward E., "Let's Take the Con Out of Econometrics," *American Economic Review* 73 (1983), 31–43.

Marx, Karl, *Lohnarbeit und Kapital* (Berlin: Karl Kautsky, 1930).

Pigou, A. C., "Some Remarks on Utility," *The Economic Journal* 13 (1903), 58–68.

Pollak, Robert A., "Endogenous Tastes in Demand and Welfare Analysis," *The American Economic Review* 68 (1978), 374–379.

Rader, Trout, "The Second Theorem of Welfare Economics When Utilities Are Interdependent," *Journal of Economic Theory* 23 (1980), 420–424.

Runciman, W. G., *Relative Deprivation and Social Justice* (London: Routledge and Kegan Paul, 1966).

Stigler, George J., and Gary S. Becker, "De Gustibus non est Disputandum," *The American Economic Review* 67 (1977), 76–90.

Van der Wijk, J., *Inkomens- en Vermogensverdeling* (Haarlem: De Erven F. Bohn N. V., 1939).

Van Herwaarden, Floor G., Arie Kapteyn and Bernard M. S. van Praag, "Twelve Thousand Individual Welfare Functions of Income," *European Economic Review* 9 (1977), 283–300.

Van Herwaarden, Floor G., and Arie Kapteyn, "Empirical Comparison of the Shape of Welfare Functions," *European Economic Review* 15 (1981), 261–286.

Van Praag, Bernard M. S., *Individual Welfare Functions and Consumer Behavior* (Amsterdam: North-Holland Publishing Company, 1968).

______, "The Welfare Function of Income in Belgium: An Empirical Investigation," *European Economic Review* 2 (1971), 337–369.

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A. C. Pigou
The Economic Journal, Vol. 13, No. 49. (Mar., 1903), pp. 58-68.
Stable URL:
http://links.jstor.org/sici?sici=0013-0133%28190303%2913%3A49%3C58%3ASROU%3E2.0.CO%3B2-8

[1] **A Theory of Social Interactions**
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The Journal of Political Economy, Vol. 82, No. 6. (Nov. - Dec., 1974), pp. 1063-1093.
Stable URL:
http://links.jstor.org/sici?sici=0022-3808%28197411%2F12%2982%3A6%3C1063%3AATOSI%3E2.0.CO%3B2-W

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References

A Theory of Social Interactions
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